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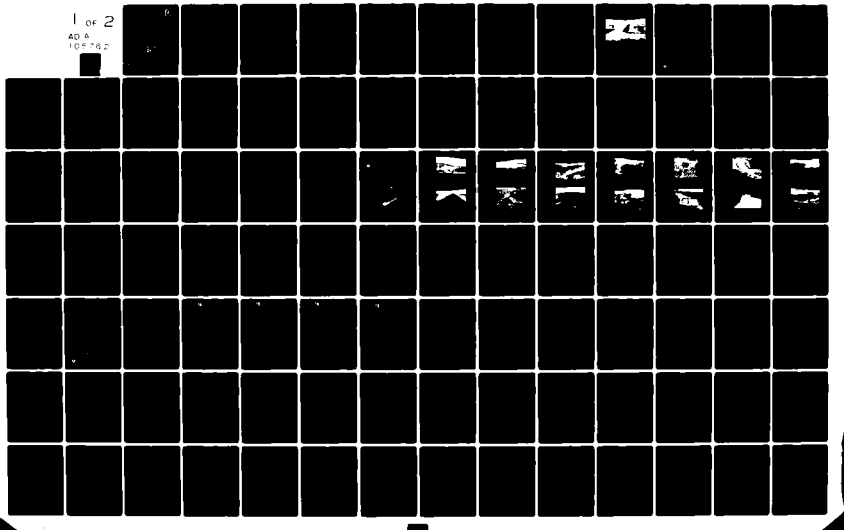


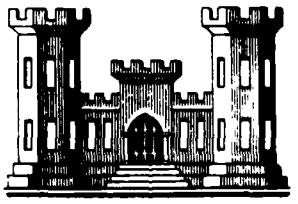
LEVEL II

SUSQUEHANNA RIVER BASIN

LITTLE CHOCONUT WATERSHED SITE 2B DAM

BROOME COUNTY, NEW YORK
INVENTORY No. NY 721

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



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NEW YORK DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1981

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Site 2B Dam
Broome County
Susquehanna River Basin

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Examination of available documents and a visual inspection of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which need to be evaluated and remedied.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Hydrologic/hydraulic analyses performed in accordance with the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams indicate that the principal spillway and the emergency spillway would pass 100 percent of the outflow from the Probable Maximum Flood (PMF) without overtopping the dam. Therefore, the combined spillway capacity is adjudged to be adequate.

D

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LITTLE CHOCONUT WATERSHED SITE 2B DAM
INVENTORY NO. NY 721
SUSQUEHANNA RIVER BASIN
BROOME COUNTY, NEW YORK

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Little Choconut Watershed Site 2B Dam
State Located:	New York
County:	Broome
Watershed:	Susquehanna River Basin
Stream:	Unnamed Tributary of Little Choconut Creek
Date of Inspection:	December 15, 1980

ASSESSMENT

Examination of available documents and a visual inspection of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which need to be evaluated and remedied.

Hydrologic/hydraulic analyses performed in accordance with the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams indicate that the principal spillway and the emergency spillway would pass 100 percent of the outflow from the Probable Maximum Flood (PMF) without overtopping the dam. Therefore, the combined spillway capacity is adjudged to be adequate.

It is recommended that the following additional investigations be performed by a registered professional engineer engaged by the owner:

1. Determine the stability characteristics and gradation of the riprap material on the channel face of the spur dike, adjacent to the right side of the dam embankment.

2. Determine the physical properties and configuration of the dam embankment Zone 2 material (See page F-5 of Appendix F) and monitor the downstream embankment slope during periods of high storage levels.

These investigations should be initiated within 6 months and completed within 18 months of the final approval date of this report. In the interim, a detailed flood warning and emergency evacuation plan should be developed and implemented.

In addition to any items required as a result of the additional investigations recommended above, the following remedial measures should be implemented to correct the existing deficiencies.

1. Monitor local slumping on the downstream face of the spur dike and determine if remedial measures are required.

2. Mow the grass on the embankment slopes at least annually and clear brush and trees from the slopes and bottom of the emergency spillway channel.

3. Inspect the deteriorated joint filler between the 30 inch principal spillway outlet pipe and the reinforced concrete impact basin to monitor for possible loss of soil.

4. Restore the riprap protection on the left side slope of the emergency spillway channel.

These corrective measures should be completed within 12 months of the final approval date of this report.

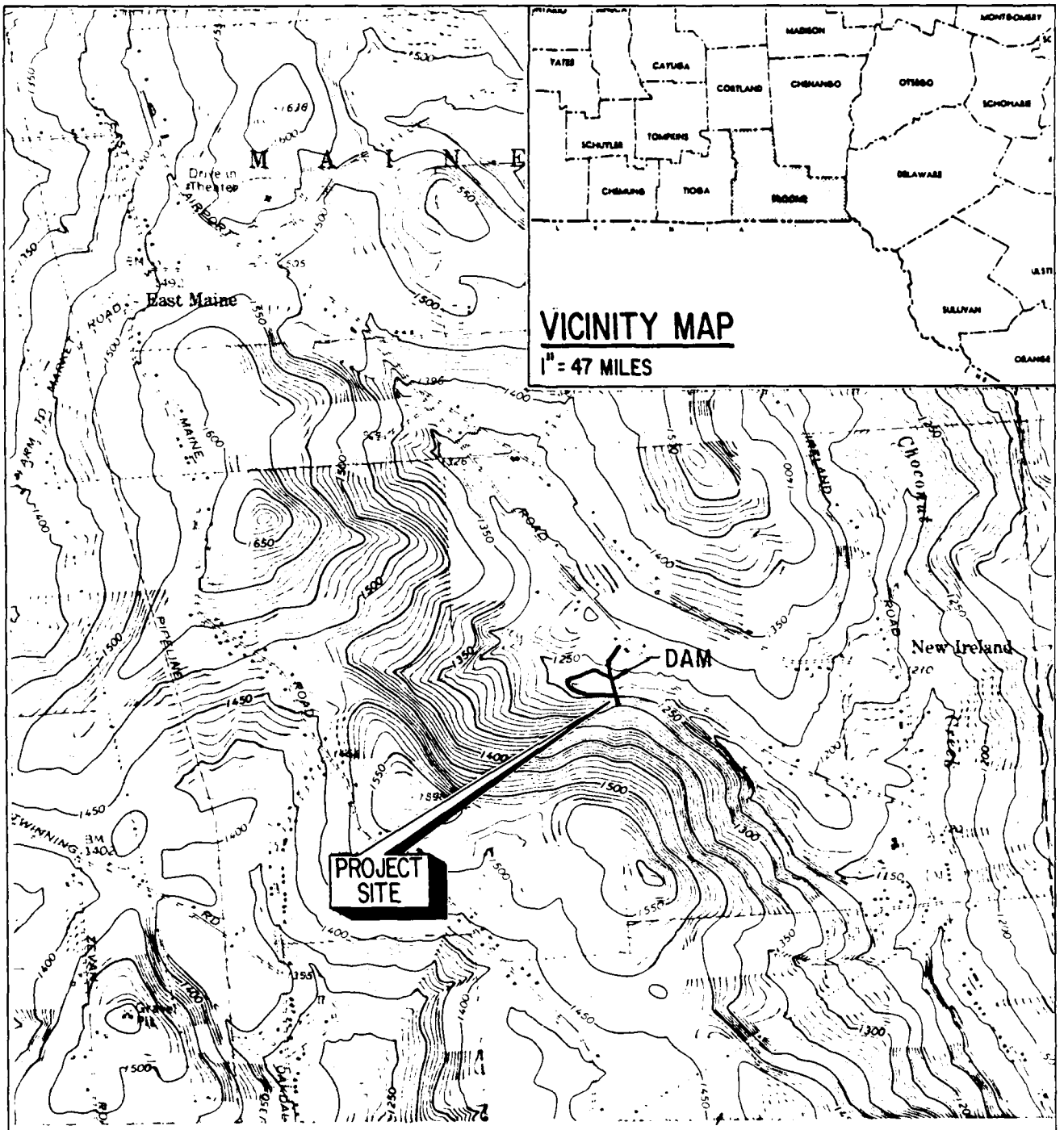
Submitted by: FLAHERTY GIAVARA ASSOCIATES, P.C.

Hugh C. Flaherty, P.E. & L.S.
Chairman of the Board
New York License No. 58508

Approved by:
Col. W. M. Smith, Jr.
New York District Engineer

Date: 30 JUN 1981

PHOTO #1: Overview of
Little Choconut Watershed Site 2B Dam
Inventory No. NY 721



LOCATION MAP

LITTLE CHOCONUT WATERSHED SITE 2B DAM

INVENTORY No. NY 721

SUSQUEHANNA RIVER BASIN
BROOME COUNTY
MAINE, NEW YORK

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SCALE IN FEET

FLAHERTY · GIAVARA ASSOCIATES, P.C.

NATIONAL DAM SAFETY PROGRAM
PHASE I INSPECTION REPORT
LITTLE CHOCONUT WATERSHED SITE 2B DAM
INVENTORY NO. NY 721
D.E.C. NO. 96A-3630
SUSGUEHANNA RIVER BASIN
BROOME COUNTY, NEW YORK

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I Inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367. Flaherty Giavara Associates, P.C. has been retained by the New York District to inspect and report on selected dams in the State of New York. Authorization and notice to proceed was issued to Flaherty Giavara Associates, P.C. under a letter of December 24, 1980 from W. M. Smith, Jr., Colonel, Corps of Engineers. Contract No. DACW 51-81-C-0006 has been assigned by the Corps of Engineers for this work.

b. Purpose

Evaluation of the existing conditions of the subject dam to identify deficiencies and hazardous conditions, determine if they constitute hazards to life and property and recommend remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

Little Choconut Watershed Site 2B Dam consists of an earthen embankment with a concrete pipe principal spillway under the central portion of the embankment and an emergency spillway channel cut into rock at the right abutment.

It is one of eight floodwater retarding dams in the Little Choconut, Finch Hollow, and Trout Brook watersheds designed to reduce floodwater damages. Plans, profiles and sections prepared for the project by the U.S. Department of Agriculture, Soil Conservation Service (SCS), are shown on drawings in Appendix F.

The dam embankment is approximately 790 feet long angling slightly downstream, 56 feet high and has an upstream slope of 3 horizontal to 1 vertical and a downstream slope of 2.5 to 1. The crest of the dam is 16 feet in width and its elevation varies from 1274.3 to 1275.3 (NGVD). There is a 10 foot wide berm at the toe of the upstream slope just below normal pond level. The embankment cross section is primarily compacted glacial till, with an internal zone of highly fractured shale and siltstone. It has a 12 to 14 foot wide cutoff of compacted glacial till extending 5 to 17 feet below the original ground surface. The cutoff extends into weathered rock under the right abutment slope and into glacial till under the left abutment. The upstream and downstream slopes are provided with grass cover (crown vetch) for erosion protection, except for riprap at the entrance to the emergency spillway and a small area around the principal spillway outlet. The embankment has an internal drain in pervious fill near the downstream toe for over half its length. Two 8 inch diameter perforated bituminous-coated corrugated metal pipes discharge into the impact basin of the principal spillway outlet, one on either side of the outlet pipe.

The principal spillway is a drop inlet structure consisting of a single stage reinforced concrete riser, a 30 inch diameter prestressed concrete cylinder pipe (PCCP) and a reinforced concrete impact basin.

The emergency spillway is a 380 foot long by 55 foot wide channel cut into rock at the right abutment. The left side of the spillway is formed by a spur dike extending approximately 240 feet downstream from the right end of the dam embankment. It has a 12 foot wide crest that varies in elevation from 1267.0 to 1274.4 (NGVD). The right side slope cuts into the rock slope at 1 to 1 up to a bench, then at 2 to 1 up to existing grade; whereas the side slope along the dike forming the left side of the spillway is at 3 to 1. The downhill slope of the dike is 2.5 to 1, and its cross section is primarily glacial till with a zone of broken rock along the channel side. The emergency spillway channel slopes gently downward both upstream and downstream from a 50 foot wide level section (the spillway crest) that is close to the left end of the dam crest. The valley side slope drops steeply down at each end of the channel.

b. Location

The Little Choconut Watershed Site 2B Dam is located off Airport Road approximately one mile northwest of its intersection with New Ireland Road in the Town of Maine, New York. The dam is located at latitude north 42°-10.6'

and longitude west 75°-58.1' on the U.S. Geological Survey 7.5 minute series topographic map "Castle Creek, New York". The Location Map on page i indicates where the dam is situated.

c. Size Classification

The maximum height of the dam is 56 feet and the maximum storage capacity is 305 acre-feet. Therefore, the Little Choconut Watershed Site 2B Dam is classified as an "Intermediate" dam as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

There are approximately 2 dwellings within the dam failure flood hazard area. A high voltage transmission line as well as Airport Road and Stella Ireland Road are located downstream of the dam. Therefore, the dam is in the High Hazard category as defined by the Recommended Guidelines for Safety Inspection of Dams.

e. Ownership

The dam is owned by the County of Broome and maintained by the Broome County Soil & Water Conservation District. Their addresses and telephone numbers are as follows:

Owner

Contact: Carl S. Young, Broome County Executive
Broome County Building
Government Plaza
P.O. Box 1766
Binghamton, New York 13902

Telephone: (607) 772-2109

Maintenance

Contact: William Maxian, District Manager
Broome County Soil & Water Conservation District
Farm, Home and 4-H Center
840 Front Street
Binghamton, New York 13905

Telephone: (607) 773-2691

f. Purpose

The primary purpose of this dam is flood control in the Little Choconut Creek watershed to reduce floodwater damages.

g. Design and Construction History

This dam was designed by the SCS between June 1965 and January 1967. It was constructed in 1968 by the Talson Construction Company of Herkimer, New York. No major post construction modifications have been made to the dam.

h. Normal Operating Procedures

The intake riser is always open; therefore, the water level is maintained at the elevation of the crest of the intake weir for normal flows. There are no regular operating procedures.

1.3 PERTINENT DATA

a. Drainage Area (Square Miles)	1.60
b. Discharge at Dam Site (CFS)	
- Top of Dam	6730
- Crest of Emergency Spillway	106
- Crest of Principal Spillway	8
- Reservoir Drain Inlet	-
c. Elevations (NGVD)	
- Top of Dam	1274.3
- Design High Water Level	1266.8
- Crest of Emergency Spillway	1263.0
- Crest of Principal Spillway	1242.5
- Reservoir Drain Inlet	1233.5
d. Reservoir Surface Area (Acres)	
- Top of Dam	34.8
- Design High Water Level	26.0
- Crest of Emergency Spillway	21.8
- Crest of Principal Spillway	4.0

e. Storage (Acre-Feet)

- Top of Dam	533
- Design High Water Level	305
- Crest of Emergency Spillway	212
- Crest of Principal Spillway	14

f. Dam

- Type: Compacted earthfill with a glacial till cutoff	
- Length (Feet)	790
- Upstream Slope (H:V)	3:1
- Downstream Slope (H:V)	2.5:1
- Crest Width (Feet)	16

g. Emergency Spillway

- Type: Excavated channel in rock with riprap and rock-faced earthen spur dike	
- Length (Feet)	380
- Bottom Width (Feet)	55
- Sideslopes (H:V)	
left	3:1
right - rock cut	1:1
- earth cut	2:1
- Channel Bottom Slopes (Feet/Foot)	
upstream	0.010
downstream	0.025

h. Principal Spillway

- Type: Drop inlet structure consisting of a single stage reinforced concrete riser, a 30 inch diameter prestressed concrete cylinder pipe (230 feet long) and a reinforced concrete impact basin at the outlet end of the conduit

- Control: None

i. Reservoir Drain

- Type: 12 inch diameter cast iron mechanical joint pipe (41 feet long) having a trash rack and concrete pad and draining into the reinforced concrete riser

- Control: 12 inch diameter slide gate located at the inlet to the

reinforced concrete riser

j. Toe Drain

- Type: Two 8 inch diameter perforated bituminous-coated corrugated metal pipes in pervious fill

- Control: None

SECTION 2 - ENGINEERING DATA

2.1 GEOTECHNICAL DATA

a. Geology

The Little Choconut Watershed Site 2B Dam is located in the Appalachian Plateau physiographic province of New York State. The topography of the area ranges from 810 feet in the Susquehanna River to more than 1500 feet in the vicinity of this site. The total relief is less today than it was pre-glacially, owing to aggradation of till on the uplands and valley sides and deposition of outwash and alluvial materials in river channels. This site is a good example of outwash and alluvial materials filling a pre-glacial valley.

Glacial ice had little effect on the topography in this area. The ice sheet was relatively thin, extending only some 40 miles south of the Binghamton area.

The underlying bedrock is Upper Devonian in age and is almost exclusively shales and siltstones of the Catskill Delta.

The geologic history of this site appears to be one of glacial scour of the north-facing valley wall (right abutment) and filling of the pre-glacial valley with lacustrine and alluvial deposits. Apparently, there has been some erosion of the bedrock in the lower elevation of the right abutment. Drill holes (DH) and test pits (TP) reveal the development of a shelf in the bedrock surface at about present stream bed elevation. This situation is further verified by the enhanced steepness of the abutment for a vertical distance of 30 feet or so above this shelf. This condition has been noted on other sites in this area and verified by drilling.

b. Subsurface Investigations

1. Centerline of Dam

The left abutment of this site is a fairly uniform glacial till. This uniformity extends down to the area of the principal spillway, and to a depth of at least 30 feet at DH 51 (See Appendix F - Profiles).

In the floodplain, the till is replaced by a moderately dirty gravel to an average depth of 3 feet. This gravel is underalin by a 3 to 5 foot layer of stiff clay. Under the clay, a moderately thick zone of coarse sand extends to below backhoe depth.

DH 52 went through this sand and back into till, with bedrock being encountered at a depth of approximately 33 feet. Seepage was heavy in backhoe pits excavated in this material during design.

On the right side of the floodplain, the backhoe trench revealed the bedrock surface rising steeply from its location at DH 52 to within about 4 feet of the surface. It forms a definite bench at this level and then follows parallel with the ground surface to a point beyond the emergency spillway excavation. The average depth to bedrock over this entire abutment is about 3 feet.

The bedrock encountered in this investigation is predominantly a siltstone with zones of softer shale. Several thin beds of very fine-grained sandstone are mapped in the type section of this Rhinestreet Formation and were also logged in some of the drill holes on this site. Whereas, the overall picture of bedrock in this section of the state indicates a very gentle dip to the southwest, in this immediate vicinity the strata dip 60° to the southwest at a rate of about 90 feet to the mile.

A well developed set of north-south oriented joints exists in the bedrock in this area. This pattern is intersected by a less well developed east-west trending set.

2. Principal Spillway

The two 20 foot drill holes located in the area of the riser and outlet structure were logged as 11 to 13 feet of very dense till, underlain by 1 to 2 feet of very silty gravel or clay. Below this, dense till was again encountered to a depth of 20 feet. The backhoe pit at the intersection of the center of dam and the principal spillway was also logged as 8 feet of dense till with one large 3 to 4 foot boulder in the pit.

3. Emergency Spillway

The entire spillway area is in the bedrock more fully described under "Centerline of Dam". This rock is overlain by an average depth of 3.5 feet of silty gravel; a glacial till.

2.2 DESIGN RECORDS

This dam was designed by the SCS from 1965 through 1967. As part of the design process, a design report, a geology report

and soils testing were completed for the site. This data is included in Appendix D.

2.3 CONSTRUCTION RECORDS

This dam was constructed in 1968 by the Talson Construction Company of Herkimer, New York. The contract drawings, which were prepared by the SCS, have been updated to reflect "As-Built" conditions and are included in Appendix F. In addition, detailed records kept by the SCS during construction are available at their office in Syracuse, New York.

2.4 OPERATION RECORDS

There were no operation records available for this dam.

2.5 EVALUATION OF DATA

The data presented herein was obtained primarily from the offices of SCS in Syracuse, New York and also from the files of the New York State Department of Environmental Conservation (DEC). This information appears to be reliable and adequate for the purposes of a Phase I Inspection Report.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of the Little Choconut Watershed Site 2B Dam was conducted on December 15, 1980. The weather was hazy and the temperature was 20± °F. At the time of this inspection, there was approximately two inches of snow on the crest of the dam; however, the slopes had little or no snow cover. Water was flowing in the principal spillway outlet pipe.

b. Dam

The earthfill embankment of the dam is generally in good condition. There was no visible evidence of settlement, lateral movement, seepage, major erosion, or other serious defects.

The following specific items were noted:

1. A minor slough has occurred on the downstream embankment slope of the spur dike forming the left side of the emergency spillway. The condition is local and may be due to freeze-thaw conditions.

2. The grass has been cut short on the relatively level surfaces, but is about 18 inches high on the embankment and cut slopes (See Photos No. 2, 3, 4, 5, 6 and 7). However, the general absence of brush is indicative of past periodic cutting.

3. Scattered young trees and brush have grown through the riprap, rockfill, and rock cut slopes of the emergency spillway (See Photos No. 8 and 9).

4. Rock fragments have been locally shifted to provide a narrow path up the left slope of the emergency spillway.

5. The toe drains were in good condition. The 6 inch diameter BCCMP draining the left side of the dam embankment was discharging approximately 1± gallons per minute (GPM) into the impact basin (See Photo No. 13).

6. Minor seepage is visible from the natural slope at the entrance to the emergency spillway, and from the rock cut face of the right bank of the spillway. The present condition does not threaten the embankment or the spillway cross section.

7. The crest of the embankment was approximately 6 inches low, 70 feet from the right end. There was no other evidence of settlement or crest movement (See Photo No. 3). This may reflect locally greater settlement of the dam embankment after construction.

c. Principal Spillway

1. Drop Inlet Structure

The reinforced concrete drop inlet structure is in excellent condition (See Photo No. 11). The inlet weir has a trash rack attached to it and was free of debris. A gate stem for a lower level inlet was observed but not operated during the inspection.

2. Principal Spillway Conduit

The visible portions of the 30 inch diameter prestressed concrete cylinder pipe (PCCP) is in good condition. The interior could not be observed due to tailwater conditions and the energy dissipator baffle (See Photo No. 13).

3. Principal Spillway Outlet

The principal spillway conduit discharges at a reinforced concrete impact basin used to dissipate the energy of high velocity discharge. Overall, the structure was in excellent condition (See Photo No. 12); however, some loose riprap has accumulated on the downstream concrete apron and the joint filler between the 30 inch PCCP and the impact basin has deteriorated.

4. Principal Spillway Discharge Channel

The man-made channel below the principal spillway impact basin has a riprap lining near the embankment, and a vegetated lining further downstream (Photo No. 14). The riprap is stable and in good condition. There are several areas of minor erosion on the left bank of the channel, and one area where the channel slope has slumped.

d. Emergency Spillway

The emergency spillway is located on the right abutment and has a bottom width of 55 feet. The bottom and the right side of the emergency spillway are cut into bedrock. The left side is a dike with a riprap and rockfill surface, separating the spillway from the main embankment. The riprap had a typical mean dimension of 6

inches, and provided complete coverage of the surface. Some brush and saplings were growing up through or on the riprap, and should be removed before the riprap becomes dislodged. (See Photos No. 8 and 9).

The approach to the spillway is approximately 100 feet long, and the discharge channel runs past the embankment and then drops down the steep side of the valley to the floodplain (See Photo No. 10).

e. Downstream Channel

The natural channel downstream of the dam has a typical width of 10 to 15 feet, and a normal flow depth of 6 inches. Bedrock outcrops occur along its right side. The bed material is gravel and flaggy cobbles. The channel is stable, with no aggradation or degradation.

f. Reservoir - Storage Pool Area

The left side of the floodwater storage area is bordered by gently sloping fields with scattered trees. Upstream and on the right side a heavily wooded slope becomes moderately steep at and above the design high water level (See Photo No. 15). However, there is no significant probability of landslides into the storage pool affecting the safety of the dam. There are no visible signs of instability or sedimentation problems in the reservoir area.

3.2 EVALUATION OF OBSERVATIONS

The visual inspection revealed some minor deficiencies. The following observations were made:

1. A minor slough was noted on the downstream slope of the spur dike.

2. The grass was cut short on the relatively level surfaces, but is 18± inches high on the embankment and cut slopes.

3. Scattered young trees and brush have grown through the riprap, rockfill and rock cut slopes of the emergency spillway.

4. The joint filler between the 30 inch PCCP and the impact basin has deteriorated.

5. Rock fragments have been locally shifted to provide a footpath up the left slope of the emergency spillway.

6. The left toe drain was discharging into the impact at a rate of about 1± GPM.

7. Some loose riprap has accumulated on the apron of the reinforced concrete impact basin.

8. Several areas of minor erosion were noted on the left bank of the principal spillway discharge channel.

9. Minor seepage was visible from the natural slope at the entrance to the emergency spillway and from the rock cut face of the right side slope of the emergency spillway.

10. The crest of the dam was observed to be 6± inches low, 70 feet from the right abutment.

Based on the visual examination conducted on December 15, 1980, the Little Choconut Watershed Site 2B Dam is considered to be in good condition. Minor deficiencies which have been observed should not have a serious effect on the performance or safety of the structure.

SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The normal water surface level is maintained by the crest of the drop inlet structure at elevation 1242.5 (NGVD). No operational procedures are in effect at this time.

4.2 MAINTENANCE OF DAM

The dam is maintained by the Broome County Soil & Water Conservation District. Presently, the following yearly maintenance items are performed:

a. Mowing the dam crest and part of the floodplain; however, the mowing of the slopes of the embankment is only done every three years.

b. Maintenance of riprap.

c. Maintenance of the trash rack on the structure.

d. Inspection of concrete and pipes.

e. Inspection of the dam embankment for seepage.

f. Operation of the gate uses to drain the impoundment.

g. Repairs to fences and roads are made as necessary.

4.3 WARNING SYSTEM

No warning system is now in effect; however, the Broome County Soil & Water Conservation District is in the process of preparing an emergency action plan and warning system for the dam to be implemented in the event of dam failure.

4.4 EVALUATION

The operation and maintenance procedures of the dam and appurtenances are satisfactory. However, increased maintenance efforts are required to correct the minor deficiencies which exist.

SECTION 5 - HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA

The dam is located on an unnamed tributary 5500± feet upstream of Little Choconut Creek. The unnamed tributary joins Little Choconut Creek near New Ireland, approximately six miles upstream of the Susquehanna River at Johnson City, New York.

The watershed (shown on the Watershed Map in Appendix C) consists of 1024 acres (1.60 square miles) of rolling to hilly uplands with typical slopes of 10 percent. Land use within the watershed is primarily agricultural, with extensive open fields and orchards. There are no significant waterbodies or wetlands upstream of the dam.

The watercourse upon which the dam is located is a small perennial stream with a typical flow width of 10 feet and a typical flow depth of 6 inches.

5.2 ANALYSIS CRITERIA

The purpose of the hydrologic/hydraulic analysis is to evaluate the spillway capacity and the potential for overtopping.

The analysis of the spillway capacity of the dam and storage of the reservoir was performed using the Corps of Engineers HEC-1 computer model - Dam Safety Version. The procedure included determining the Probable Maximum Flood (PMF) runoff from the watershed and routing the inflow hydrograph through the impoundment to determine the outflow hydrograph. The unit hydrograph was defined by the Snyder Synthetic Unit Hydrograph method, and the modified Puls routing procedure was incorporated.

The initial rainfall loss was assumed to be 1.0 inches, and the uniform rainfall loss was assumed to be 0.1 inches per hour. In accordance with recommended guidelines of the Corps of Engineers, the Probable Maximum Precipitation (PMP) was 23.5 inches (6 hour duration, 10 square mile area).

The analysis was conducted for both the full PMF and for several fractional PMF conditions. The PMF inflow of 4075 CFS was routed through the reservoir and the peak outflow was determined to be 3954 CFS.

5.3 SPILLWAY CAPACITY

The total outlet capacity is the sum of discharges from the principal spillway and the emergency spillway.

The principal spillway consists of a drop inlet structure, conduit and impact basin. Its flow capacity was evaluated by assuming that its capacity was controlled by the inlet (elevation 1242.5 NGVD), which acts as an orifice during periods of high flow.

The emergency spillway is a 55 foot wide, trapezoidal-shaped spillway cut into rock. The SCS design information indicates the emergency spillway was designed to be used only by a flood event with an average return frequency of more than 100 years.

The stage discharge curve for the combined principal and emergency spillways was obtained from the Soil Conservation Service design report for the stages above and including elevation 1263.0 (NGVD):

Stage (Feet)	Discharge Capacity (CFS)	Element of Structure
1242.5	0	Sediment Pool
1263.0	106	Emergency Spillway Crest
1266.8	1080	Design High Water Level
1274.3	6730	Top of Dam

The total spillway capacity at the top of dam is 6730 CFS.

The principal spillway can pass the peak outflow from a flood equal to approximately 16 percent of the PMF before use of the emergency spillway would be required.

The energy grade line of the PMF discharge would be 7.6 feet above the crest of the emergency spillway. The average flow velocity in the emergency spillway discharge channel would be 14.3 feet per second, which is capable of causing erosion of the riprap on the face of the spur dike at the right end of the dam embankment.

5.4 RESERVOIR CAPACITY

The storage capacity of the reservoir was obtained from the Soil Conservation Service design report, as indicated below:

Stage (Feet)	Storage (Acre-Feet)	Storage (Inches in Runoff)
1242.5	14	0.16
1263.0	212	2.48
1266.8	305	3.57
1274.3	533	6.25

5.5 FLOODS OF RECORD

The maximum floods of record for this dam are summarized below:

Date	Event	Maximum Flood Stage Elevation (NGVD)	Feet Below Crest of Emergency Spillway (El. 1263.0)
9/26/75	Hurricane Eloise	1248.4	14.6
2/24/75	--	1246.8	16.2
6/24/72	Hurricane Agnes	1245.5	17.5

It should be noted that floodwaters have never reached the emergency spillway crest.

5.6 OVERTOPPING POTENTIAL

The results of the HEC-1 DB computer analysis indicate that the crest of the dam is not overtopped by the PMF event. The PMF peak discharge rate of 3954 cfs would occur at a peak flood stage of 1270.6 feet, which is 3.7 feet below the crest of the dam.

The results of the analysis are tabulated below:

Flood Condition	Peak Inflow (CFS)	Peak Outflow (CFS)	Maximum Stage Elevation (NGVD)
0.5 PMF	2037	1947	1268.0
1.0 PMF	4075	3954	1270.6

5.7 EVALUATION

Using the Corps of Engineers' screening criteria for the initial review of spillway adequacy, it has been determined that the dam would not be overtopped by either the full Probable Maximum Flood (PMF) or one half the PMF. Approximately 3.7 feet of freeboard would exist between the PMF maximum water level and the crest of the dam. Therefore, the spillway is adjudged to be adequate.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

There was no visible evidence of major settlement, lateral movement or other signs of overall structural instability of the dam during the site examination. However, the pool level was approximately 30 feet below the top of the dam at the time, with the result that the forces tending to cause instability were much lower than design levels. Based on the conditions that were observed, there is no reason to question the static structural stability of the dam.

b. Design and Construction Data

Soil Conservation Service record drawings for the Little Choconut Watershed Site 2B Dam, (See Appendix F) show a configuration and cross section for the dam embankment that generally corresponds to the information presented and analyzed in the SCS Geology Report, dated December 1965; in the memorandum presenting test results and stability analyses, dated March 8, 1966; and in the Design Report, dated September 1966. One apparent difference is the inclusion of a zone of highly fractured shale and siltstone within the dam embankment and extending toward the downstream face. This is depicted on Sheet No. 5 (page F-5) of the "As-Built" drawings, contained in Appendix F.

There is no construction data available to confirm the actual physical properties and configuration of the earth and rockfill in the embankment. However, the earth design properties presented in the SCS reports are considered to be reasonable, and as along as the zone of highly fractured rock has relatively low permeability the dam would be expected to have adequate safety margins with respect to stability under static loading conditions. Additionally, toe drains control the phreatic surface and provide a safe outlet for foundation seepage.

A slope stability analysis was performed by the SCS on the embankment of the dam using the Swedish Circle method and adopted design data (See page D-7 of Appendix D). The results of the analysis are tabulated below:

Location	Slope (H:V)	Conditions	Factor of Safety
Downstream Slope	2.5:1	No drain; no berm; radius = 71.0 feet	2.2

The assumptions and method used are considered reasonable; therefore, the resulting factor of safety is adequate.

c. Seismic Stability

The Little Choconut Watershed Site 2B Dam is located in Seismic Zone 1, and in accordance with recommended Phase I guidelines does not require seismic analysis.

SECTION 7 - ASSESSMENT/RECOMMENDATIONS

7.1 DAM ASSESSMENT

a. Condition

On the basis of the visual examination, the Little Choconut Watershed Site 2B Dam is considered to be in good condition. There were no signs of impending structural failure or other conditions which would warrant urgent remedial action, however, deficiencies were noted which when studied in detail may prove to be of a serious nature.

b. Adequacy of Information

The evaluation of this dam is based primarily on visual examination, reference to available SCS plans, approximate hydraulic and hydrologic computations, and application of engineering judgement. The visual examination was somewhat hampered by low pool level and light snow cover; however, the available information and that which was obtained is adequate for the purposes of a Phase I assessment.

c. Need for Additional Investigations

It is recommended that the following additional investigations be performed by a registered professional engineer engaged by the owner:

1. Determine the stability characteristics and gradation of the riprap material on the channel face of the spur dike at the right end of the dam embankment to ensure that the riprap will not erode during high flow velocities.

2. Conduct a detailed review of construction records to the determine the physical properties and configuration of dam embankment Zone 2 material. If there remains a question as to possible seepage to the downstream face, the embankment slope should be regularly monitored during high storage levels to determine whether corrective measures are necessary.

d. Urgency

The additional investigations recommended in Section 7.1c should be initiated within 6 months and appropriate remedial measures completed within 18 months of the final approval date of this report. In the interim, a detailed flood warning and emergency evacuation plan should be developed and implemented. The recommended measures

presented in Section 7.2 should be carried out by the owner within 12 months of the final approval date of this report.

7.2 RECOMMENDED MEASURES

Although the dam is generally in good condition, it is considered important that the following items be accomplished:

1. Monitor local slumping on the downstream face of the spur dike to determine if continued movements are occurring. If they are, remedial action such as excavating slumping material and replacing it with free-draining material, may be required.

2. Mow the grassed slopes of the dam embankment at least annually and clear brush and trees from the slopes and bottom of the emergency spillway channel.

3. Inspect the deteriorated joint filler between the 30 inch principal spillway outlet pipe and the reinforced concrete impact basin to monitor for possible loss of soil.

4. Restore the left side slope of the emergency spillway channel where rock fragments (riprap) have been shifted to provide a path.

APPENDIX A

PHOTOGRAPHS

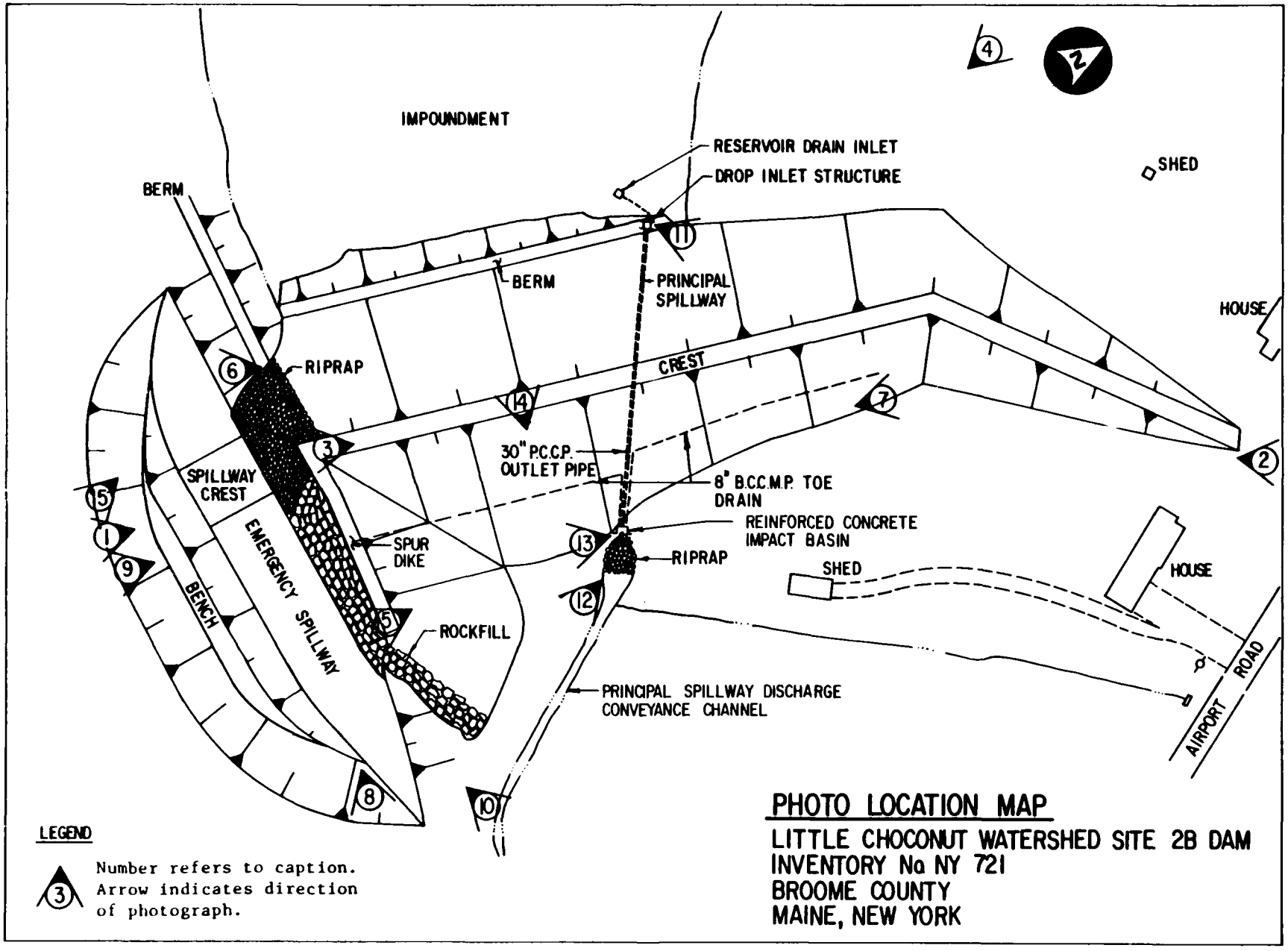

IMPOUNDMENT
RESERVOIR DRAIN INLET
DROP INLET STRUCTURE
SHED
BERM
BERM
PRINCIPAL SPILLWAY
HOUSE
RIPRAP
CREST
30" P.C.C.P. OUTLET PIPE
8" B.C.C.M.P. TOE DRAIN
SPILLWAY CREST
EMERGENCY SPILLWAY
BENCH
SPUR DIKE
REINFORCED CONCRETE IMPACT BASIN
RIPRAP
SHED
HOUSE
ROCKFILL
PRINCIPAL SPILLWAY DISCHARGE CONVEYANCE CHANNEL
AIRPORT ROAD
LEGEND
Number refers to caption.
Arrow indicates direction of photograph.
PHOTO LOCATION MAP
LITTLE CHOCONUT WATERSHED SITE 2B DAM
INVENTORY No NY 721
BROOME COUNTY
MAINE, NEW YORK

PHOTO #2: Overview of dam from left abutment

PHOTO #3: Crest of dam looking toward left abutment

PHOTO #4: Overview of upstream face of dam

PHOTO #5: Overview of downstream face of dam

PHOTO #6: Upstream face of dam

PHOTO #7: Downstream face of dam

PHOTO #8: Emergency spillway looking upstream

PHOTO #9: Riprap and rockfill bank of the emergency spillway

PHOTO #10: Emergency spillway outlet

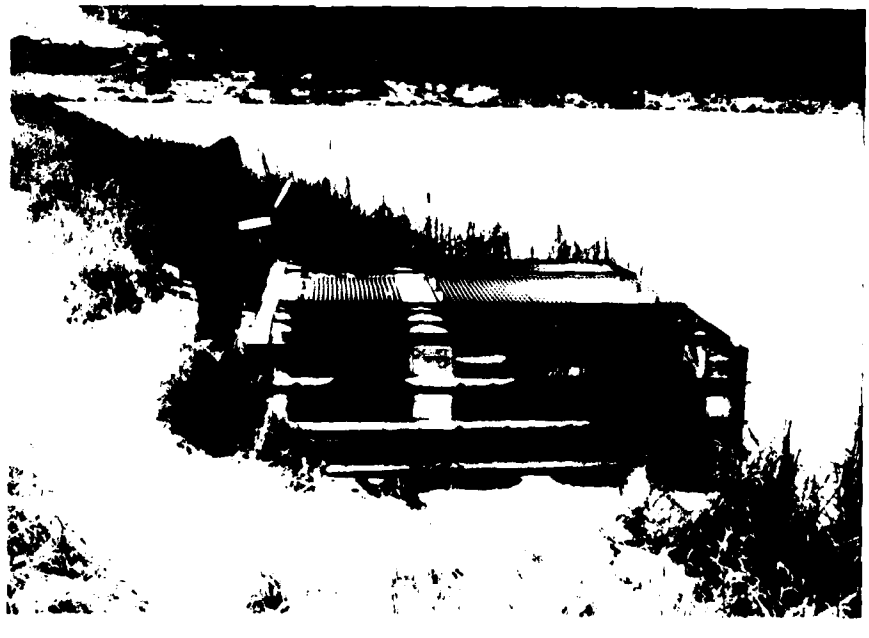


PHOTO #11: Drop inlet structure

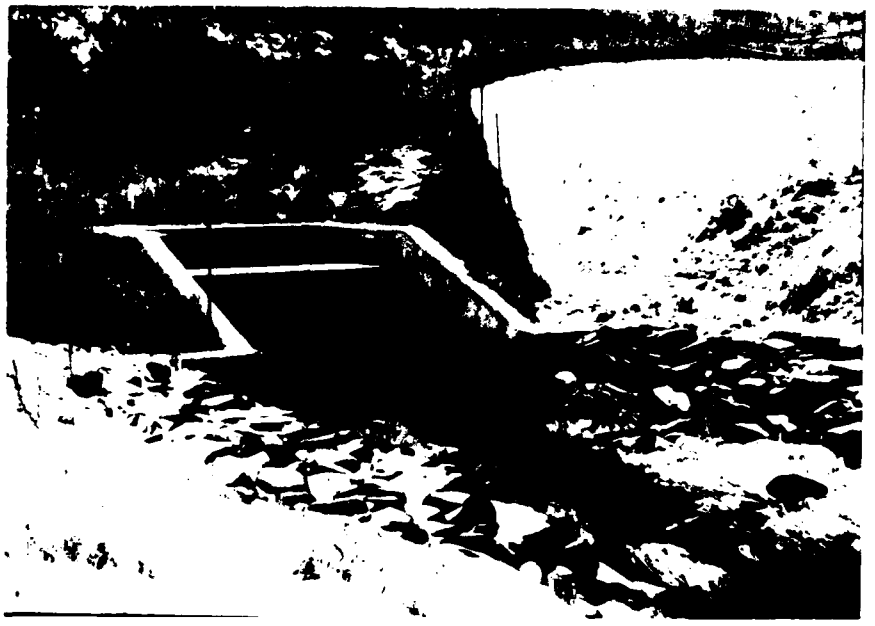


PHOTO #12: Outlet works: Impact basin

PHOTO #13: Toe drain discharging into impact basin

PHOTO #14: Downstream channel conditions

PHOTO #15: Impoundment

APPENDIX B

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam Little Choconut Watershed Site 2B Dam

Fed. I.D. # NY 721 **DEC Dam No.** 96A-3630

River Basin Susquehanna

Location: Town Maine **County** Broome

Stream Name Unnamed

Tributary of Little Choconut Creek

Latitude (N) 42°-10.6' **Longitude (W)** 75°-58.1'

Type of Dam Earthen Embankment

Hazard Category High

Date(s) of Inspection December 15, 1980

Weather Conditions Hazy 20±°F.

Reservoir Level at Time of Inspection Elevation 1242.5

b. Inspection Personnel

R.C. Smith, T.L. Ward & J.G. MacBroom of Flaherty Giavara Associates, P.C., P.L. LeCount & J.J. Rixner of Haley & Aldrich Inc., S. Dhawan & L. Comrie of Salmon Associates

c. Persons Contacted (Including Address & Phone No.)

Gary L. Page	Donald W. Lake, Jr.
Binghamton Watershed Office Soil Conservation Service	Soil Conservation Service
P.O. Box 1255 Broome County Airport	771 Federal Building 100 South Clinton Street
Binghamton, New York 13902 (607) 773-2751	Syracuse, New York 13260 (315) 423-5505

d. History:

Date Constructed 1968 **Date(s)** Reconstructed Never

Designer Soil Conservation Service (U.S.D.A.)

Constructed By Talson Construction

Owner County of Broome

2) Embankment

a. Characteristics

(1) Embankment Material Silty gravel and highly fractured shale and siltstone

(2) Cutoff Type Compacted glacial till

(3) Impervious Core None

(4) Internal Drainage System Two perforated 8 inch BCCMP toe drains on either side of the principal spillway outlet; both pipes flowing ($1\frac{+}{}$ GPM each)

(5) Miscellaneous No comments

b. Crest

(1) Vertical Alignment Excellent; slightly crowned at the center of the dam

(2) Horizontal Alignment Excellent; angled slightly downstream toward the left abutment

(3) Surface Cracks None observed

(4) Miscellaneous Mowed grass

c. Upstream Slope

(1) Slope (Estimate - V:H) 1:3

(2) Undesirable Growth or Debris, Animal Burrows None observed

(3) Sloughing, Subsidence or Depressions None evident

(4) **Slope Protection** Grass, 18 to 24 inches high on entire slope except for riprap at the emergency spillway entrance

(5) **Surface Cracks or Movement at Toe** None evident; footpath along berm at toe of slope

d. **Downstream Slope**

(1) **Slope (Estimate - V:H)** 1:2.5

(2) **Undesirable Growth or Debris, Animal Burrows** None observed

(3) **Sloughing, Subsidence or Depressions** None evident

(4) **Surface Cracks or Movement at Toe** None observed

(5) **Seepage** None observed

(6) **External Drainage System (Ditches, Trenches, Blanket)** None observed

(7) **Condition Around Outlet Structure** Outlet pipe discharges into reinforced concrete impact basin

(8) **Seepage Beyond Toe** None observed

e. **Abutments - Embankment Contact**

Good condition; some slight seepage located on the slope below the berm, just upstream of the right abutment.

(1) **Erosion at Contact** None evident

(2) **Seepage Along Contact** Some seepage from the flat-lying shale of the 1 to 1 rock slope along the right side of the emergency spillway.

3) **Drainage System**

a. **Description of System** Drop inlet structure consisting of a single stage reinforced concrete riser, a 30 inch diameter conduit and a reinforced concrete impact basin.

b. **Condition of System** Excellent

c. **Discharge from Drainage System** Discharge from the impact basin flows over riprap to a grassed channel

4) **Instrumentation** (Monumentation/Surveys, Observation Wells, Weirs, Peizometers, Etc.)

Monumentation of centerline of dam

5) **Reservoir**

a. **Slopes** Gently sloping fields with scattered trees on all sides except the right side and upstream of it which has heavily wooded slopesbecoming moderately steep at and above the design high water level

b. **Sedimentation** Design figures for storage allow for 58.1 acre-feet of sediment

c. **Unusual Conditions Which Affect Dam** Low sediment pool level

6) **Area Downstream of Dam**

a. **Downstream Hazard (No. of Homes, Highways, etc.)** Approximately 2 dwellings are within the dam failure flood hazard area as well as Airport Road and Stella Ireland Road

b. **Seepage, Unusual Growth** None observed

c. **Evidence of Movement Beyond Toe of Dam** None observed

d. **Condition of Downstream Channel** Stable, no aggradation or degradation

7) **Spillway(s) (Including Discharge Conveyance Channel)**

Principal spillway, emergency spillway and discharge conveyance channel

a. **General** Principal spillway and discharge conveyance channel handle normal flows, while the emergency spillway conveys flood events with average return frequencies greater than 100 years.

b. **Condition of Principal Spillway** Very good; however, riprap that has accumulated on the downstream concrete apron of the impact basin should be removed because it will diminish the dissipating effect of the vertical end sill of the basin

c. **Condition of Emergency Spillway** Very good; however, some brush and saplings were growing up through or on the riprap and rockfill slopes which should be removed to prevent this slope protection from becoming dislodged

d. **Condition of Discharge Conveyance Channel** Good the riprap is stable; however, there are several areas of minor erosion of the left bank, one in particular where the channel slope has slid downward.

8) **Reservoir Drain/Outlet**

Type: **Pipe** Two **Conduit** _____ **Other** _____

Material: **Concrete** X **Metal** X **Other** _____

Size: Concrete: 30 inch, Metal: 12 inch **Length** 230 feet and 41 feet

Invert Elevations: **Entrance** 1233.5 **Exit** 1226.5

Physical Condition (Describe): **Unobservable** _____

Material: Prestressed concrete cylinder and cast iron

Joints: Rubber/steel and mechanical **Alignment** Straight

Structural Integrity: Excellent

Hydraulic Capability: Good

Means of Control: **Gate** Slide Gate **Valve** _____ **Uncontrolled** _____

Operation: **Operable** X **Inoperable** _____ **Uncontrolled** _____

Present Condition (Describe): Each pipe is in excellent condition

9) **Structural**

a. **Concrete Surfaces** Excellent condition

b. **Structural Cracking** None observed

c. **Movement - Horizontal & Vertical Alignment (Settlement)** None evident

d. **Junctions with Abutments or Embankments** Not applicable

e. **Drains - Foundation, Joint, Face** See Section 2) Embankment, a. Characteristics, (4) Internal Drainage System

f. **Water Passages, Conduits, Sluices** 12 inch slide gate on the reservoir drain at its inlet to the reinforced concrete riser

g. **Seepage or Leakage** None observed

h. **Joints - Construction, etc.** Rubber and steel joints on the 30" prestressed concrete cylinder pipe and mechanical joints on the 12" reservoir drain

i. **Foundation** Not applicable

j. **Abutments** Not applicable

k. **Control Gates** 12" slide gate on the reservoir drain at its inlet to the reinforced concrete riser

l. **Approach & Outlet Channels** Not applicable

m. **Energy Dissipators (Plunge Pool, etc.)** Reinforced concrete impact basin at the principal spillway outlet

n. **Intake Structures** Reinforced concrete riser having two sides acting as weirs having a total length of 6 feet, 8 inches

o. **Stability** No evidence of structural instability

p. **Miscellaneous** No comments

10) Appurtenant Structures (Power House, Lock, Gatehouse, Other)

a. Description and Condition None

APPENDIX C

HYDROLOGIC/HYDRAULIC ENGINEERING DATA AND COMPUTATIONS

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

AREA-CAPACITY DATA:

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
1) Top of Dam	1274.3	34.8	533
2) Design High Water (Max. Design Pool)	1266.8	26.0	305
3) Emergency Spillway Crest	1263.0	21.8	212
4) Pool Level with Flashboards	--	--	--
5) Principal Spillway Crest	1242.5	4.0	14

DISCHARGES:

	Volume (cfs)
1) Average Daily	3±
2) Emergency Spillway @ Maximum High Water (Top of Dam)	6624
3) Emergency Spillway @ Design High Water	974
4) Principal Spillway @ Emergency Spillway Crest	106
5) Low Level Outlet @ Principal Spillway Crest	8
6) Total (of all facilities) @ Maximum High Water	6730
7) Maximum Known Flood	Unknown
8) At Time of Inspection	1±

CREST: **ELEVATION:** 1274.3

Type Vegetated Earth Embankment

Width 16 Feet **Length** 762 Feet

Spillover

Location

SPILLWAY:

PRINCIPAL		EMERGENCY
1242.5	**Elevation**	1263.0
Drop Inlet	**Type**	Rock Cut & Rock Lined
	Width	55 Feet
	Type of Control	
X	**Uncontrolled**	X
-	**Controlled**	-
-	**Type:** (Flashboards; gate)	-
One	**Number**	One
30 inch/230 feet	**Size/Length**	55 feet/380 feet
concrete	**Invert Material**	bedrock
-	**Anticipated Length of Operating Service**	-
272'± Conduit	**Chute Length**	235± Feet
1.0 Foot	**Height Between Spillway Crest & Approach Channel Invert (Weir Flow)**	S= 0.010 on the approach channel

Type:

Location:

Records:

Date September 26, 1975

Max. Reading Elevation 1248.4 (NGVD)

FLOOD WATER CONTROL SYSTEM:

Warning System Under preparation by the Broome County Soil & Water Conservation District

Method of Controlled Releases (mechanisms) Manually controlled slide gate to drain impoundment

DRAINAGE AREA: 1024 Acres; 1.60 Square Miles

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type Rural, agriculture

Terrain - Relief Steep Uplands

Surface - Soil Glacial Till

Runoff Potential (existing or planned extensive alterations to existing (surface or subsurface conditions)

High, due to steep slopes and lack of upstream storage areas

Potential Sedimentation problem areas (natural or man-made; present or future)

None

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

None

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the reservoir perimeter:

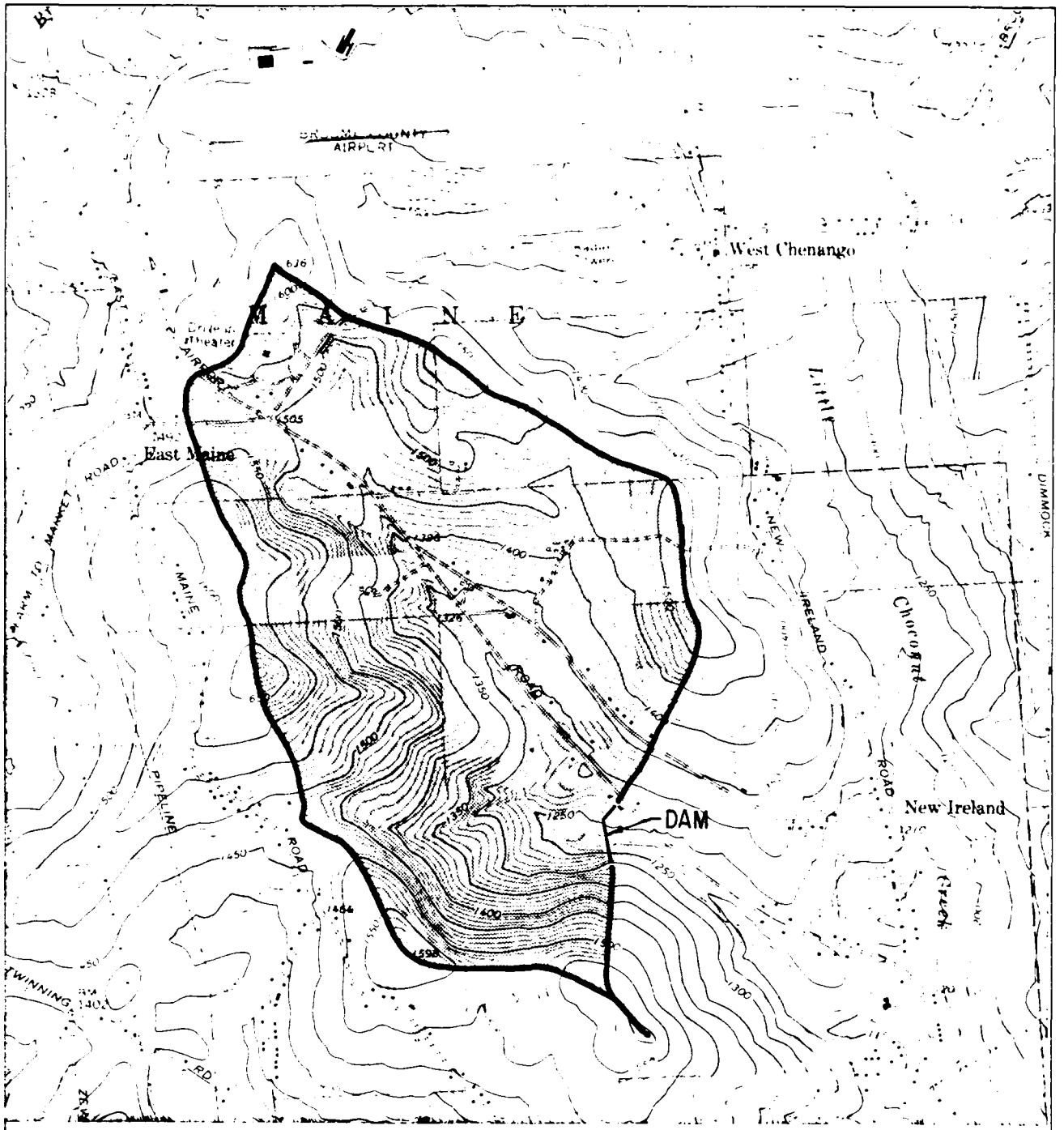
Location: Spur dike at the right end of the dam embankment

Elevation: 1267.0 to 1274.4 (NGVD)

Reservoir:

Length @ Maximum Pool 1,000 feet = 0.2 miles **(Miles)**

Length of Shoreline (@ Spillway Crest) 4,500± feet = 0.5 miles **(Miles)**



WATERSHED MAP

LITTLE CHOCONUT WATERSHED SITE 2B DAM

INVENTORY No. NY 721

SUSQUEHANNA RIVER BASIN
BROOME COUNTY
MAINE, NEW YORK

FLAHERTY · GIAVARA ASSOCIATES P.C.

CALCULATIONS

PROJECT _____

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

SHEET NO. 1 OF 1
BY _____ DATE _____
CHK'D. BY _____ DATE _____

WATERSHED DATA
FOR HEC-1 SNYDER HYDROGRAPH

1) TIME TO PEAK (T_p)

$$T_p = C_T \left(\frac{L \times L_c}{\sqrt{S}} \right)^N$$

$L = 10,200$ FT $= 1.93$ Miles

$L_c = 4,500$ FT $= 0.85$ Miles

$\Delta h = 1636 - 1230 = 406$

$S = \frac{406}{10,200} = 0.0398$

$C_T = 1.2$ FOR STEEP SLOPES

$T_p = (1.2) \left(\frac{1.93 \times 0.85}{\sqrt{0.0398}} \right)^{0.3} = 2.37$ HRS

2) SET $C_p = 0.63$ FOR HIGHLAND

3) % IMPERVIOUS

RUNWAY = 21,000 SF × 100% / 525,000 SF
= 145 ACRES / 525 ACRES

5%

1.2%

4) WATERSHED TABLE

PROJECT

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

SHEET NO. OF
BY DATE
CHK'D. BY DATE

[illegible] Data From [illegible]

[illegible] Hour Duration [illegible]

Duration	Accumulation
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

PROJECT [illegible] CHILE
IV # 721

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA NEW HAVEN CONN 06510/203/789-1260

SHEET NO [illegible] OF [illegible]
BY JSM DATE 2/5/81
CHK'D. BY TLW DATE 2/9/81

EMERGENCY SPILLWAY DISCHARGE CHANNEL

$b = 55$ FT
$z = 3:1$ & $1:1$, SAY $2:1$ AVERAGE
$S = 2.5\ \%$
$N = 0.04$
$Q = 3954$ CFS

FIND D, A, V

$$Q = \frac{K'}{N} b^{8/3} S^{1/2}$$ (KINGS HANDBOOK, TABLE 7-11)

$$K' = \frac{3954(0.04)}{(55)^{2.67}(0.025)^{0.5}} = 0.02256$$

INTERPOLATE

$$\frac{0.02256 - 0.0183}{0.0231 - 0.0183} = 0.8875$$

$$\frac{D}{b} = 0.07 + 0.00887 = 0.07887$$

$$D = 55(0.07887) = 4.34 \text{ FT}$$

$$A = 55'(4.34') + \tfrac{1}{2}(4.34)(4.34 \times 3) + \tfrac{1}{2}(4.34 \times 4.34)$$
$$= 238.7 + 28.2 + 9.4 = 276.3 \text{ FT}^2$$

$$V = \frac{Q}{A} = \frac{3954 \text{ CFS}}{276.3 \text{ FT}^2} = 14.3 \text{ FPS}$$

PROJECT [illegible] DAMS
NY # 721

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA NEW HAVEN, CONN 06510/203/789-1260

SHEET NO. 1 OF [illegible]
BY JSM DATE 2/6/81
CHK'D. BY TCW DATE 2/9/81

RIPRAP STABILITY

1) CRITICAL BOTTOM SHEAR

$$T_c = 0.04(\gamma_s - \gamma) D_{50} \qquad D_{50} = 6'' = 0.5'$$

$$T_c = 0.04\ (2.7-1.0)(62.4)\ (0.5') = 2.12\ \text{Lbs/FT}^2$$

2) CRITICAL SIDE SHEAR ON 3:1 SLOPE

$$T_{cs} = K T_c \qquad (EM-1110-2-1601)$$

$$T_{cs} = 0.87(2) = 1.76\ \text{Lbs/FT}^2$$

3) LOCAL BOUNDARY SHEAR @ TOE OF RIPRAP SLOPE

$$T_o = \frac{\gamma V^2}{\left(32.6 \log \frac{12.2 R}{D_{50}}\right)^2} \qquad (EM-1110-2-1601)$$

$$R = \frac{A}{P} = \frac{276.3\ \text{FT}^2}{55 + (1.414 \times 4.34) + \sqrt{(4.34 \times 3)^2 + (4.34)^2}}$$

$$= \frac{276.3}{55 + 6.14 + 13.72} = 3.69$$

$$T_o = \frac{62.4(14.3)^2}{\left(32.6 \log \frac{12.2(3.69)}{0.5}\right)^2} = \frac{12760.2}{4059.5} = 3.14$$

$$T_o = 3.14\ \text{Lbs/FT}^2$$

4) $T_o > T_c$, RIPRAP MOVEMENT IS POSSIBLE

HEC-1 FLOOD HYDROGRAPH COMPUTATIONS

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
Dam Safety VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
     1                  A1   NATIONAL DAM INSPECTION PROGRAM  PHASE 1 REPORT  CORPS OF ENGINEERS
     2                  A2   DAM I.D. #NY721  SITE 2-B BROOME COUNTY NEW YORK 2/2/81
     3                  A3   PREPARED BY FLAHERTY GIAVARA ASSOC., NEW HAVEN, CONNECTICUT
     4                  B    120       0       30        0        0        0        0        2        0        0
     5                  B1     5
     6                  J      1       9        1
     7                  J1   0.1     0.2      0.3      0.4      0.5      0.6      0.7      0.8      1.0
     8                  K      0       1                          0        0        1
     9                  K1   INFLOW HYDROGRAPH, SNYDER METHOD
    10                  M      1       1      1.6                 0        1                          1
    11                  P      0    23.5      100      110      120      127
    12                  T                                                    1      0.1                0.013
    13                  W   2.67    0.63
    14                  X   -2.0     2.0      1.0
    15                  K      1       1                          0        1        1        0
    16                  K1   RESERVOIR ROUTING  MODIFIED PULS METHOD
    17                  Y                                  1        1
    18                  Y1     3                                                 13.8       -1
    19                  Y41242.5  1263.0   1266.8   1274.3
    20                  Y5     0   106.0   1080.0   6730.0
    21                  $A   4.0    21.8     26.0     34.8
    22                  $E1242.5  1263.0   1266.8   1274.3
    23                  $$1263.0
    24                  $D1274.3     2.5      1.5    762.0
    25                  K     99
1                              PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                    RUNOFF HYDROGRAPH AT            1
                                    ROUTE HYDROGRAPH TO             1
                                    END OF NETWORK

**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
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[illegible] VERSION JULY 1 .
LAST MODIFICATION 26 FEB 79
****

RUN DATE 81/02/03.
TIME 10.00.16.

NATIONAL DAM INSPECTION PROGRAM PHASE 1 REPORT CORPS OF ENGINEERS
DAM I.D. #NY721 SITE 2-B BROOME COUNTY NEW YORK 2/2/81
PREPARED BY FLAHERTY GIAVARA ASSOC., NEW HAVEN, CONNECTICUT

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
120	0	30	0	0	0	0	2	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1

RTIOS= .10 .20 .30 .40 .50 .60 .70 .80 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH, SNYDER METHOD

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	1.60	0.00	1.60	1.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	23.50	100.00	110.00	120.00	127.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.10	0.00	.01

UNIT HYDROGRAPH DATA
TP= 2.67 CP= .63 NTA= 0

RECESSION DATA
STRTQ= -2.00 QRCSN= 2.00 RTIOR= 1.00
ALTERNATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 6.32 AND R= 4.81 INTERVALS

UNIT HYDROGRAPH 29 END-OF-PERIOD ORDINATES, LAG= 2.69 HOURS, CP= .63 VOL= 1.00

17.	63.	124.	184.	228.	243.	224.	185.	150.	122.
99.	80.	65.	53.	43.	35.	28.	23.	19.	15.
12.	10.	8.	7.	5.	4.	4.	3.	2.	

END-OF-PERIOD FLOW

HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
.30	1	.00	.00	.00	3.	6.30	61	.20	.15	.05	57.
1.00	2	.00	.00	.00	3.	7.00	62	.20	.15	.05	66.
1.30	3	.00	.00	.00	3.	7.30	63	.20	.15	.05	83.
2.00	4	.00	.00	.00	3.	8.00	64	.20	.15	.05	104.

1.01	2.30	5	.00	.00	.00	3.	1.02	8.30	65	.20	.15	.05	136.
1.01	3.00	6	.00	.00	.00	3.	1.02	9.00	66	.20	.15	.05	161.
1.01	3.30	7	.00	.00	.00	3.	1.02	9.30	67	.20	.15	.05	188.
1.01	4.00	8	.00	.00	.00	3.	1.02	10.00	68	.20	.15	.05	210.
1.01	4.30	9	.00	.00	.00	3.	1.02	10.30	69	.20	.15	.05	228.
1.01	5.00	10	.00	.00	.00	3.	1.02	11.00	70	.20	.15	.05	243.
1.01	5.30	11	.00	.00	.00	3.	1.02	11.30	71	.20	.15	.05	254.
1.01	6.00	12	.00	.00	.00	3.	1.02	12.00	72	.20	.15	.05	264.
1.01	6.30	13	.01	.00	.01	3.	1.02	12.30	73	1.18	1.13	.05	289.
1.01	7.00	14	.01	.00	.01	3.	1.02	13.00	74	1.18	1.13	.05	357.
1.01	7.30	15	.01	.00	.01	3.	1.02	13.30	75	1.41	1.36	.05	487.
1.01	8.00	16	.01	.00	.01	3.	1.02	14.00	76	1.41	1.36	.05	686.
1.01	8.30	17	.01	.00	.01	3.	1.02	14.30	77	1.76	1.71	.05	948.
1.01	9.00	18	.01	.00	.01	3.	1.02	15.00	78	1.76	1.71	.05	1254.
1.01	9.30	19	.01	.00	.01	3.	1.02	15.30	79	2.14	2.09	.05	1579.
1.01	10.00	20	.01	.00	.01	3.	1.02	16.00	80	6.79	6.74	.05	1908.
1.01	10.30	21	.01	.00	.01	3.	1.02	16.30	81	1.65	1.60	.05	2520.
1.01	11.00	22	.01	.00	.01	3.	1.02	17.00	82	1.65	1.60	.05	3089.
1.01	11.30	23	.01	.00	.01	3.	1.02	17.30	83	1.29	1.24	.05	3603.
1.01	12.00	24	.01	.00	.01	3.	1.02	18.00	84	1.29	1.24	.05	3957.
1.01	12.30	25	.07	.00	.07	3.	1.02	18.30	85	.12	.07	.05	4075.
1.01	13.00	26	.07	.00	.07	4.	1.02	19.00	86	.12	.07	.05	3909.
1.01	13.30	27	.08	.00	.08	4.	1.02	19.30	87	.12	.07	.05	3541.
1.01	14.00	28	.08	.00	.08	4.	1.02	20.00	88	.12	.07	.05	3107.
1.01	14.30	29	.10	.00	.10	4.	1.02	20.30	89	.12	.07	.05	2653.
1.01	15.00	30	.10	.00	.10	4.	1.02	21.00	90	.12	.07	.05	2215.
1.01	15.30	31	.13	.00	.12	4.	1.02	21.30	91	.12	.07	.05	1829.
1.01	16.00	32	.40	.19	.20	8.	1.02	22.00	92	.12	.07	.05	1511.
1.01	16.30	33	.10	.05	.05	18.	1.02	22.30	93	.12	.07	.05	1253.
1.01	17.00	34	.10	.05	.05	33.	1.02	23.00	94	.12	.07	.05	1044.
1.01	17.30	35	.08	.03	.05	50.	1.02	23.30	95	.12	.07	.05	875.
1.01	18.00	36	.08	.03	.05	66.	1.03	0.00	96	.12	.07	.05	737.
1.01	18.30	37	.01	.00	.01	76.	1.03	.30	97	0.00	0.00	0.00	624.
1.01	19.00	38	.01	.00	.01	78.	1.03	1.00	98	0.00	0.00	0.00	529.
1.01	19.30	39	.01	.00	.01	73.	1.03	1.30	99	0.00	0.00	0.00	446.
1.01	20.00	40	.01	.00	.01	64.	1.03	2.00	100	0.00	0.00	0.00	374.
1.01	20.30	41	.01	.00	.01	55.	1.03	2.30	101	0.00	0.00	0.00	310.
1.01	21.00	42	.01	.00	.01	46.	1.03	3.00	102	0.00	0.00	0.00	252.
1.01	21.30	43	.01	.00	.01	38.	1.03	3.30	103	0.00	0.00	0.00	203.
1.01	22.00	44	.01	.00	.01	32.	1.03	4.00	104	0.00	0.00	0.00	163.
1.01	22.30	45	.01	.00	.01	26.	1.03	4.30	105	0.00	0.00	0.00	130.
1.01	23.00	46	.01	.00	.01	22.	1.03	5.00	106	0.00	0.00	0.00	103.
1.01	23.30	47	.01	.00	.01	19.	1.03	5.30	107	0.00	0.00	0.00	81.
1.02	0.00	48	.01	.00	.01	16.	1.03	6.00	108	0.00	0.00	0.00	63.
1.02	.30	49	.08	.03	.05	14.	1.03	6.30	109	0.00	0.00	0.00	39.
1.02	1.00	50	.08	.03	.05	14.	1.03	7.00	110	0.00	0.00	0.00	29.
1.02	1.30	51	.08	.03	.05	16.	1.03	7.30	111	0.00	0.00	0.00	21.
1.02	2.00	52	.08	.03	.05	20.	1.03	8.00	112	0.00	0.00	0.00	15.
1.02	2.30	53	.08	.03	.05	26.	1.03	8.30	113	0.00	0.00	0.00	11.
1.02	3.00	54	.08	.03	.05	32.	1.03	9.00	114	0.00	0.00	0.00	9.
1.02	3.30	55	.08	.03	.05	38.	1.03	9.30	115	0.00	0.00	0.00	8.
1.02	4.00	56	.08	.03	.05	42.	1.03	10.00	116	0.00	0.00	0.00	7.
1.02	4.30	57	.08	.03	.05	46.	1.03	10.30	117	0.00	0.00	0.00	6.
1.02	5.00	58	.08	.03	.05	49.	1.03	11.00	118	0.00	0.00	0.00	5.
1.02	5.30	59	.08	.03	.05	52.	1.03	11.30	119	0.00	0.00	0.00	5.
1.02	6.00	60	.08	.03	.05	54.	1.03	12.00	120	0.00	0.00	0.00	4.
									SUM	29.84	26.18	3.66	54154.
										(758.)	(665.)	(93.)	(1533.47)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	402%.	3030.	1099.	451.	54159.
CMS	11%.	86.	31.	13.	1534.
INCHES		17.62	25.57	26.24	26.24
MM		447.46	649.30	666.49	666.49
% OF IT		150%.	100%.	98%.	98%.

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0.	500.	1000.	1500.	2000.	2500.	3000.	3500.	4000.	4500.	0.	0.	0
											PRECIP(L) AND EXCESS(X)		
	0.	0.	0.	0.	0.	0.	0.	0.	8.	6.	4.	2.	0
.30	1I	.	.	.	.	.	.	.	.	.	.	.	
1.00	2I	.	.	.	.	.	.	.	.	.	.	.	
1.30	3I	.	.	.	.	.	.	.	.	.	.	.	
2.00	4I	.	.	.	.	.	.	.	.	.	.	.	
2.30	5I	.	.	.	.	.	.	.	.	.	.	.	
3.00	6I	.	.	.	.	.	.	.	.	.	.	.	
3.30	7I	.	.	.	.	.	.	.	.	.	.	.	
4.00	8I	.	.	.	.	.	.	.	.	.	.	.	
4.30	9I	.	.	.	.	.	.	.	.	.	.	.	
5.00	10I	.	.	.	.	.	.	.	.	.	.	.	
5.30	11I	.	.	.	.	.	.	.	.	.	.	.	
6.00	12I	.	.	.	.	.	.	.	.	.	.	.	
6.30	13I	.	.	.	.	.	.	.	.	.	.	.	
7.00	14I	.	.	.	.	.	.	.	.	.	.	.	
7.30	15I	.	.	.	.	.	.	.	.	.	.	.	
8.00	16I	.	.	.	.	.	.	.	.	.	.	.	
8.30	17I	.	.	.	.	.	.	.	.	.	.	.	
9.00	18I	.	.	.	.	.	.	.	.	.	.	.	
9.30	19I	.	.	.	.	.	.	.	.	.	.	.	
10.00	20I	.	.	.	.	.	.	.	.	.	.	.	
10.30	21I	.	.	.	.	.	.	.	.	.	.	.	
11.00	22I	.	.	.	.	.	.	.	.	.	.	.	
11.30	23I	.	.	.	.	.	.	.	.	.	.	.	
12.00	24I	.	.	.	.	.	.	.	.	.	.	.	
12.30	25I	.	.	.	.	.	.	.	.	.	.	.	
13.00	26I	.	.	.	.	.	.	.	.	.	.	.	
13.30	27I	.	.	.	.	.	.	.	.	.	.	.	
14.00	28I	.	.	.	.	.	.	.	.	.	.	.	
14.30	29I	.	.	.	.	.	.	.	.	.	.	.	
15.00	30I	.	.	.	.	.	.	.	.	.	.	.	
15.30	31I	.	.	.	.	.	.	.	.	.	.	.	
16.00	32I	.	.	.	.	.	.	.	.	.	.	.	X
16.30	33I	.	.	.	.	.	.	.	.	.	.	.	
17.00	34.I	.	.	.	.	.	.	.	.	.	.	.	
17.30	35.I	.	.	.	.	.	.	.	.	.	.	.	
18.00	36.I	.	.	.	.	.	.	.	.	.	.	.	
18.30	37.I	.	.	.	.	.	.	.	.	.	.	.	
19.00	38.I	.	.	.	.	.	.	.	.	.	.	.	
19.30	39.I	.	.	.	.	.	.	.	.	.	.	.	
20.00	40.I	.	.	.	.	.	.	.	.	.	.	.	
20.30	41.I	.	.	.	.	.	.	.	.	.	.	.	
21.00	42.I	.	.	.	.	.	.	.	.	.	.	.	
21.30	43.I	.	.	.	.	.	.	.	.	.	.	.	
22.00	44.I	.	.	.	.	.	.	.	.	.	.	.	
22.30	45.I	.	.	.	.	.	.	.	.	.	.	.	
23.00	46I	.	.	.	.	.	.	.	.	.	.	.	
23.30	47I	.	.	.	.	.	.	.	.	.	.	.	
0.00	48I	.	.	.	.	.	.	.	.	.	.	.	
.30	49I	.	.	.	.	.	.	.	.	.	.	.	
1.00	50I	.	.	.	.	.	.	.	.	.	.	.	
1.30	51I	.	.	.	.	.	.	.	.	.	.	.	
2.00	52I	.	.	.	.	.	.	.	.	.	.	.	
2.30	53I	.	.	.	.	.	.	.	.	.	.	.	

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	2.	3.	5.	7.	8.	8.	7.	6.
6.	5.	4.	3.	3.	2.	2.	2.	1.	1.
2.	2.	3.	3.	4.	4.	5.	5.	5.	5.
6.	7.	8.	10.	13.	16.	19.	21.	23.	24.
25.	26.	29.	36.	49.	69.	95.	125.	158.	199.
252.	309.	360.	396.	407.	391.	354.	311.	265.	221.
183.	151.	125.	104.	87.	74.	62.	53.	45.	37.
31.	25.	20.	16.	13.	10.	8.	6.	4.	3.
2.	2.	1.	1.	1.	1.	1.	1.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	407.	303.	110.	45.	5416.
CMS	12.	9.	3.	1.	153.
INCHES		1.76	2.56	2.62	2.62
MM		44.75	64.94	66.65	66.65
AC-FT		150.	218.	224.	224.
THOUS CU M		185.	269.	276.	276.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	2.	4.	7.	10.	13.	15.	16.	15.	13.
11.	9.	8.	6.	5.	4.	4.	3.	3.	3.
3.	4.	5.	6.	8.	8.	9.	10.	10.	11.
11.	13.	16.	21.	26.	32.	38.	42.	46.	49.
51.	53.	58.	71.	97.	137.	190.	251.	316.	398.
504.	618.	721.	791.	815.	782.	708.	621.	531.	443.
366.	302.	251.	209.	175.	147.	125.	106.	89.	75.
62.	50.	41.	33.	26.	21.	16.	13.	8.	6.
4.	3.	2.	2.	2.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	815.	606.	220.	90.	10832.
CMS	23.	17.	6.	3.	307.
INCHES		3.52	5.11	5.25	5.25
MM		89.49	129.88	133.30	133.30
AC-FT		301.	436.	448.	448.
THOUS CU M		371.	538.	552.	552.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	2.	5.	10.	15.	20.	23.	23.	22.	19.
17.	14.	11.	10.	8.	7.	6.	5.	4.	4.
5.	6.	8.	10.	11.	13.	14.	15.	16.	16.
17.	20.	25.	31.	40.	48.	56.	63.	68.	73.
76.	79.	87.	107.	146.	206.	284.	376.	474.	596.
756.	927.	1081.	1187.	1222.	1173.	1062.	932.	796.	664.
539.	435.	376.	313.	263.	221.	187.	159.	134.	113.
93.	76.	61.	49.	39.	31.	24.	19.	12.	8.
6.	5.	3.	3.	2.	2.	2.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1222.	909.	350.	135.	16248.
CMS	35.	26.	9.	4.	460.
INCHES		5.28	7.67	7.87	7.87
MM		134.24	194.82	199.95	199.95
AC-FT		451.	654.	671.	671.
THOUS CU M		556.	807.	828.	828.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	2.	2.	2.
2.	3.	7.	13.	20.	26.	30.	31.	29.	26.
22.	19.	15.	13.	11.	9.	7.	6.	6.	6.
6.	8.	10.	13.	15.	17.	18.	20.	21.	22.
23.	26.	33.	42.	53.	64.	75.	84.	91.	97.
102.	106.	116.	143.	195.	275.	379.	502.	632.	795.
1008.	1236.	1441.	1583.	1630.	1564.	1416.	1243.	1061.	886.
731.	604.	501.	418.	350.	295.	249.	211.	179.	150.
124.	101.	81.	65.	52.	41.	32.	25.	16.	12.
8.	6.	5.	4.	3.	3.	2.	2.	2.	2.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1630.	1212.	440.	181.	21664.
CMS	46.	31.	12.	5.	613.
INCHES		7.05	10.23	10.50	10.50
MM		178.98	259.76	266.60	266.60
AC-FT		601.	872.	895.	895.
THOUS CU M		741.	1076.	1104.	1104.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	4.	9.	16.	25.	33.	38.	39.	36.	32.
28.	23.	19.	16.	13.	11.	9.	8.	7.	7.
8.	10.	13.	16.	19.	21.	23.	25.	26.	27.
29.	33.	41.	52.	66.	81.	94.	105.	114.	121.
127.	132.	144.	178.	243.	343.	474.	627.	790.	994.
1260.	1545.	1802.	1978.	2037.	1955.	1771.	1553.	1326.	1107.
914.	756.	627.	522.	437.	368.	312.	264.	223.	187.
155.	126.	102.	82.	65.	52.	41.	31.	19.	15.
11.	8.	5.	5.	4.	3.	3.	3.	2.	2.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2037.	1515.	550.	226.	27079.
CMS	58.	43.	16.	6.	767.
INCHES		8.81	12.78	13.12	13.12
MM		223.73	324.70	333.25	333.25
AC-FT		751.	1090.	1119.	1119.
THOUS CU M		927.	1345.	1380.	1380.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	3.	3.
3.	5.	11.	20.	30.	39.	46.	47.	44.	39.
33.	28.	23.	19.	16.	13.	11.	9.	8.	8.
10.	12.	15.	19.	24.	31.	38.	46.	55.	67.
81.	98.	118.	143.	174.	213.	261.	317.	384.	463.

1783.	1966.	2126.	2264.	2379.	2470.	2537.	2583.	2608.	2613.
1512.	1854.	2162.	2374.	2445.	2345.	2125.	1864.	1592.	1329.
1097.	907.	752.	627.	525.	442.	374.	317.	268.	224.
186.	151.	122.	98.	78.	62.	49.	38.	23.	17.
13.	9.	6.	6.	5.	4.	4.	3.	3.	3.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2445.	1818.	660.	271.	32495.
CMS	69.	51.	19.	8.	920.
INCHES		10.57	15.34	15.74	15.74
MM		268.48	389.64	399.89	399.89
AC-FT		902.	1308.	1343.	1343.
THOUS CU M		1112.	1614.	1656.	1656.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	3.	3.	3.	3.
3.	6.	13.	23.	35.	46.	53.	54.	51.	45.
39.	32.	27.	22.	18.	15.	13.	11.	10.	10.
11.	14.	18.	22.	26.	30.	32.	35.	36.	38.
40.	46.	57.	73.	92.	113.	132.	147.	160.	170.
178.	185.	202.	250.	341.	481.	664.	878.	1105.	1392.
1764.	2163.	2522.	2770.	2852.	2736.	2479.	2175.	1857.	1550.
1280.	1058.	877.	731.	612.	516.	437.	370.	313.	262.
217.	176.	142.	114.	91.	72.	57.	44.	27.	20.
15.	11.	8.	6.	6.	5.	4.	4.	3.	3.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2852.	2121.	770.	316.	37911.
CMS	81.	60.	22.	9.	1074.
INCHES		12.33	17.90	18.37	18.37
MM		313.22	454.58	466.54	466.54
AC-FT		1052.	1526.	1567.	1567.
THOUS CU M		1297.	1883.	1932.	1932.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
4.	6.	14.	26.	40.	52.	61.	62.	58.	52.
44.	37.	31.	25.	21.	18.	15.	13.	11.	11.
13.	16.	20.	25.	30.	34.	37.	40.	42.	43.
46.	53.	65.	83.	106.	129.	150.	168.	182.	194.
204.	211.	231.	285.	390.	549.	759.	1003.	1263.	1591.
2016.	2472.	2883.	3165.	3260.	3127.	2833.	2485.	2122.	1772.
1463.	1209.	1003.	835.	700.	589.	499.	423.	357.	299.
248.	202.	163.	130.	104.	83.	65.	50.	31.	23.
17.	12.	9.	7.	6.	6.	5.	4.	4.	4.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3260.	2424.	880.	361.	43327.
CMS	92.	69.	25.	10.	1227.
INCHES		14.09	20.45	20.99	20.99
MM		357.92	519.52	533.19	533.19
AC-FT		1202.	1744.	1790.	1790.
THOUS CU M		1483.	2152.	2208.	2208.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	4.	4.	4.	4.	4.
4.	8.	18.	33.	50.	66.	76.	78.	73.	64.
55.	46.	38.	32.	26.	22.	19.	16.	14.	14.
16.	20.	26.	32.	38.	42.	46.	49.	52.	54.
57.	66.	82.	104.	132.	161.	188.	210.	228.	243.
254.	264.	289.	357.	487.	686.	948.	1254.	1579.	1988.
2520.	3089.	3603.	3957.	4075.	3909.	3541.	3107.	2653.	2215.
1829.	1511.	1253.	1044.	875.	737.	624.	529.	446.	374.
310.	252.	203.	163.	130.	103.	81.	63.	39.	29.
21.	15.	11.	9.	8.	7.	6.	5.	5.	4.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4075.	3030.	1099.	451.	54159.
CMS	115.	86.	31.	13.	1534.
INCHES		17.62	25.57	26.24	26.24
MM		447.46	649.40	666.49	666.49
AC-FT		1503.	2181.	2238.	2238.
THOUS CU M		1853.	2690.	2761.	2761.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

RESERVOIR ROUTING MODIFIED PULS METHOD

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	1	0	0	0	1	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
3	0	0	0.000	0.000	0.000	14.	-1

ELEV	1242.50	1263.00	1266.80	1274.30
FLOW	0.00	106.00	1080.00	6730.00
SURFACE AREA	4.	72.	26.	35.
CAPACITY	0.	240.	331.	558.
EXPOSURE	1243.	1263.	1267.	1274.

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
1263.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1274.3	2.5	1.5	762.

STATION 1, FLOW 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

5.	6.	5.	5.	5	5.	4.	4.	4.	4.
4.	4.	4.	3.	4.	4.	3.	3.	3.	3.
3.	3.	3.	2.	3.	3.	2.	2.	2.	2.
3.	2.	3.	2.	3.	3.	2.	2.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.

```
        3.        3.        3.        3.        3.        3.        3.        3.        3.        3.
        3.        3.        4.        4.        4.        5.        5.        6.        7.        7.
        8.        9.       10.       11.       12.       14.       16.       20.       24.       28.
       34.       40.       46.       53.       59.       65.       70.       74.       77.       79.
       80.       82.       82.       83.       83.       83.       83.       82.       82.       81.
       81.       80.       79.       78.       78.       77.       76.       75.       74.       73.
       72.       71.       70.       69.       68.       67.       66.       65.       64.       62.

                                             STORAGE
        5.        5.        4.        4.        4.        4.        4.        3.        3.        3.
        3.        3.        3.        3.        3.        2.        2.        2.        2.        2.
        2.        2.        2.        2.        2.        2.        1.        1.        1.        1.
        1.        1.        1.        1.        1.        2.        2.        2.        2.        2.
        2.        3.        3.        3.        3.        3.        2.        2.        2.        2.
        2.        2.        2.        2.        2.        2.        2.        2.        2.        3.
        3.        3.        3.        3.        3.        4.        4.        5.        6.        6.
        7.        8.        9.        9.       11.       13.       15.       19.       24.       30.
       38.       49.       61.       74.       88.      102.      115.      126.      135.      141.
      146.      150.      152.      154.      154.      154.      154.      153.      151.      149.
      148.      145.      143.      141.      138.      135.      132.      130.      127.      124.
      121.      118.      115.      112.      110.      107.      104.      102.       99.       96.

                                              STAGE
   1243.6    1243.6    1243.5    1243.5    1243.4    1243.4    1243.4    1243.3    1243.3    1243.3
   1243.2    1243.2    1243.2    1243.1    1243.1    1243.1    1243.1    1243.0    1243.0    1243.0
   1243.0    1242.9    1242.9    1242.9    1242.9    1242.9    1242.9    1242.8    1242.8    1242.8
   1242.8    1242.8    1242.8    1242.8    1242.8    1242.9    1242.9    1243.0    1243.0    1243.1
   1243.1    1243.1    1243.1    1243.1    1243.1    1243.1    1243.1    1243.1    1243.1    1243.1
   1243.0    1243.0    1243.0    1243.0    1243.0    1243.0    1243.1    1243.1    1243.1    1243.1
   1243.1    1243.2    1243.2    1243.3    1243.3    1243.4    1243.5    1243.7    1243.8    1243.9
   1244.1    1244.2    1244.4    1244.6    1244.8    1245.2    1245.6    1246.3    1247.0    1247.9
   1249.0    1250.2    1251.4    1252.7    1254.0    1255.0    1256.0    1256.7    1257.3    1257.7
   1258.1    1258.3    1258.4    1258.5    1258.5    1258.5    1258.5    1258.4    1258.3    1258.2
   1258.1    1258.0    1257.8    1257.7    1257.5    1257.3    1257.2    1257.0    1256.8    1256.6
   1256.4    1256.2    1256.0    1255.8    1255.6    1255.4    1255.2    1255.0    1254.8    1254.6

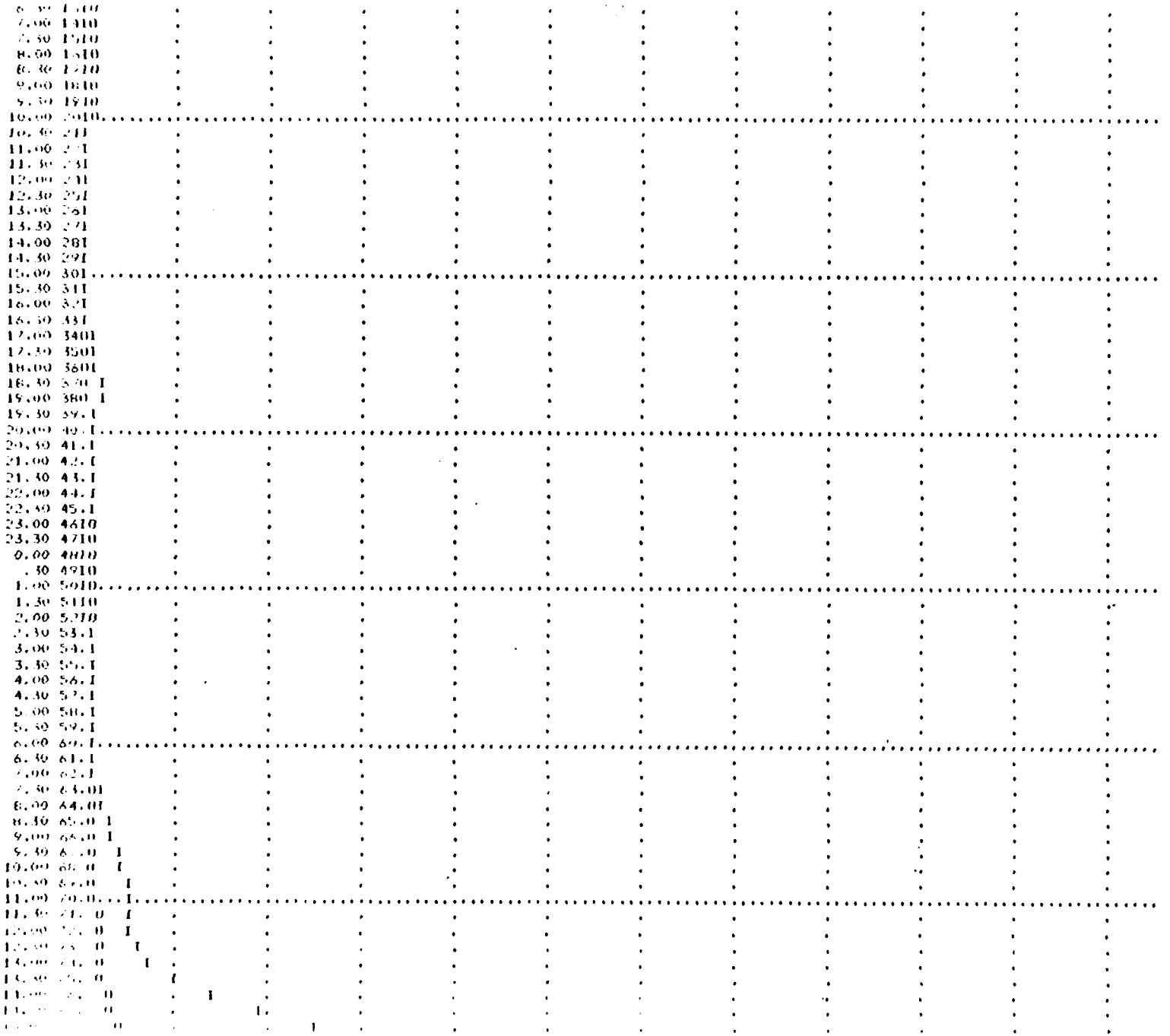
PEAK OUTFLOW IS       83. AT TIME  47.50 HOURS

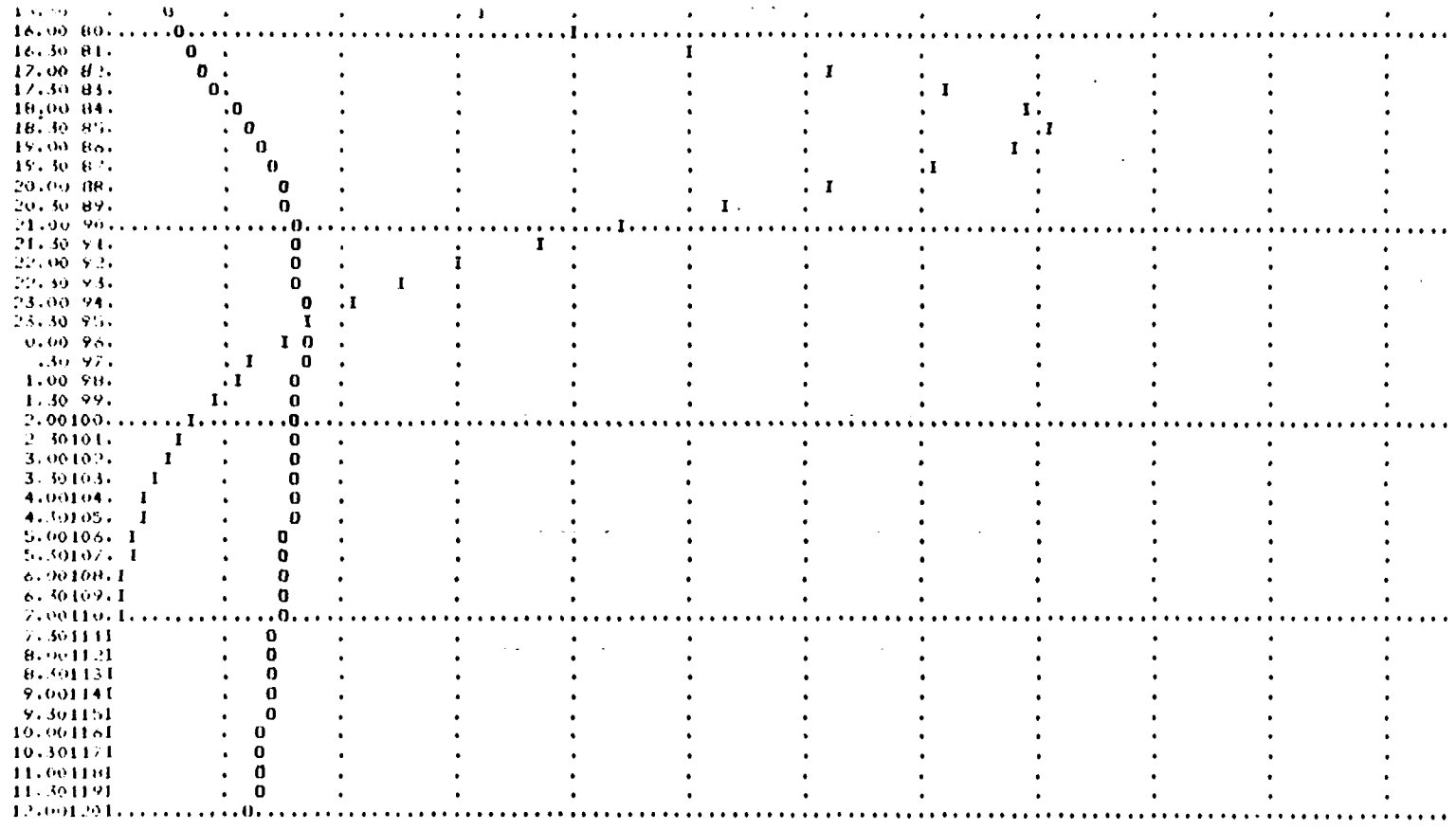
                            PEAK    6-HOUR    24-HOUR    72-HOUR   TOTAL VOLUME
                    CFS      83.       82.        62.        27.          3203.
                    CMS       2.        2.         2.         1.            91.
                 INCHES                .48       1.44       1.55          1.55
                     MM              12.07      36.48      39.42         39.42
                  AC-FT                41.       123.       132.          132.
             THOUS CU M                50.       151.       163.          163.

HYDROGRAPH

                                    STATION     1

                    INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
         0.       50.      100.      150.      200.      250.      300.      350.      400.      450.        0.        0.
   .50  1I0        .         .         .         .         .         .         .         .         .         .         .
  1.00  2I0        .         .         .         .         .         .         .         .         .         .         .
  1.50  3I0        .         .         .         .         .         .         .         .         .         .         .
  2.05  4I0        .         .         .         .         .         .         .         .         .         .         .
  2.50  5I0        .         .         .         .         .         .         .         .         .         .         .
  3.00  6I0        .         .         .         .         .         .         .         .         .         .         .
  3.50  7I0        .         .         .         .         .         .         .         .         .         .         .
  4.00  8I0        .         .         .         .         .         .         .         .         .         .         .
  4.50  9I0        .         .         .         .         .         .         .         .         .         .         .
  5.00 10I0. .......................................................................................................
  5.50 11I0        .         .         .         .         .         .         .         .         .         .         .
       12I0        .         .         .         .         .         .         .         .         .         .         .
```





STATION 1, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

6.	6.	5.	5.	5.	5.	5.	4.	4.	4.
4.	4.	4.	3.	3.	3.	3.	3.	3.	3.
3.	3.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	3.	3.	4.	4.	5.
5.	5.	6.	6.	6.	6.	6.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	6.	6.	6.
6.	7.	7.	7.	8.	9.	10.	11.	13.	14.
15.	17.	18.	20.	22.	25.	29.	34.	40.	47.
56.	64.	73.	82.	91.	99.	105.	298.	403.	434.
423.	390.	347.	303.	261.	223.	189.	161.	136.	115.
106.	105.	105.	104.	103.	102.	102.	101.	100.	99.
98.	97.	96.	95.	94.	93.	92.	91.	90.	88.

5.	5.	4.	4.	4.	4.	4.	4.	3.	3.
3.	3.	3.	3.	3.	3.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
1.	1.	2.	2.	2.	2.	3.	3.	4.	4.
4.	4.	5.	5.	5.	5.	5.	5.	4.	4.
4.	4.	4.	4.	4.	4.	4.	5.	5.	5.
5.	5.	6.	6.	7.	8.	9.	10.	11.	13.
14.	16.	17.	19.	22.	26.	31.	39.	49.	62.
79.	99.	124.	152.	182.	211.	238.	257.	266.	269.
268.	265.	261.	257.	253.	250.	247.	245.	243.	241.
239.	237.	235.	232.	229.	225.	222.	218.	215.	211.
207.	203.	199.	195.	192.	188.	184.	180.	177.	173.

STAGE

1243.6	1243.6	1243.5	1243.5	1243.5	1243.4	1243.4	1243.3	1243.3	1243.3
1243.3	1243.2	1243.2	1243.2	1243.1	1243.1	1243.1	1243.1	1243.0	1243.0
1243.0	1243.0	1243.0	1243.0	1242.9	1242.9	1242.9	1242.9	1242.9	1242.9
1242.9	1242.9	1242.9	1242.9	1243.0	1243.0	1243.1	1243.3	1243.4	1243.4
1243.5	1243.5	1243.6	1243.6	1243.6	1243.6	1243.6	1243.6	1243.5	1243.5
1243.5	1243.5	1243.5	1243.5	1243.5	1243.5	1243.5	1243.6	1243.6	1243.7
1243.7	1243.8	1243.8	1243.9	1244.1	1244.2	1244.5	1244.7	1244.9	1245.2
1245.5	1245.7	1246.0	1246.3	1246.7	1247.3	1248.1	1249.1	1250.3	1251.6
1253.1	1254.8	1256.6	1258.4	1260.1	1261.6	1262.9	1263.7	1264.2	1264.3
1264.2	1264.1	1263.9	1263.8	1263.6	1263.5	1263.3	1263.2	1263.1	1263.0
1263.0	1262.9	1262.7	1262.6	1262.5	1262.3	1262.2	1262.0	1261.8	1261.6
1261.4	1261.2	1261.0	1260.8	1260.6	1260.4	1260.2	1260.0	1259.8	1259.6

PEAK OUTFLOW IS 434. AT TIME 45.00 HOURS

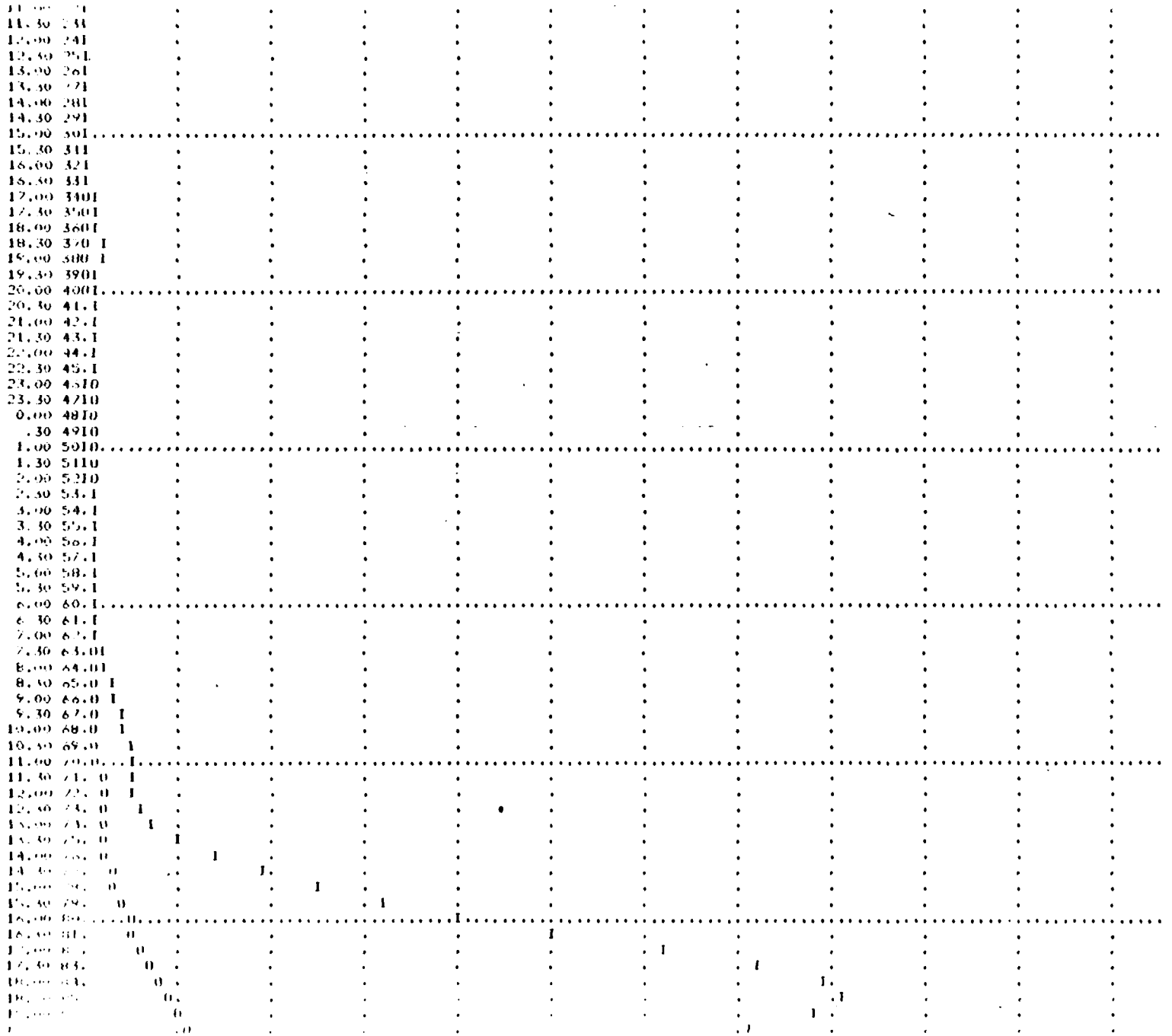
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	434.	296.	133.	56.	6762.
CMS	12.	8.	4.	2.	191.
INCHES		1.72	3.10	3.28	3.28
MM		43.70	78.85	83.21	83.21
AC FT		147.	265.	279.	279.
THOUS CU M		181.	327.	345.	345.

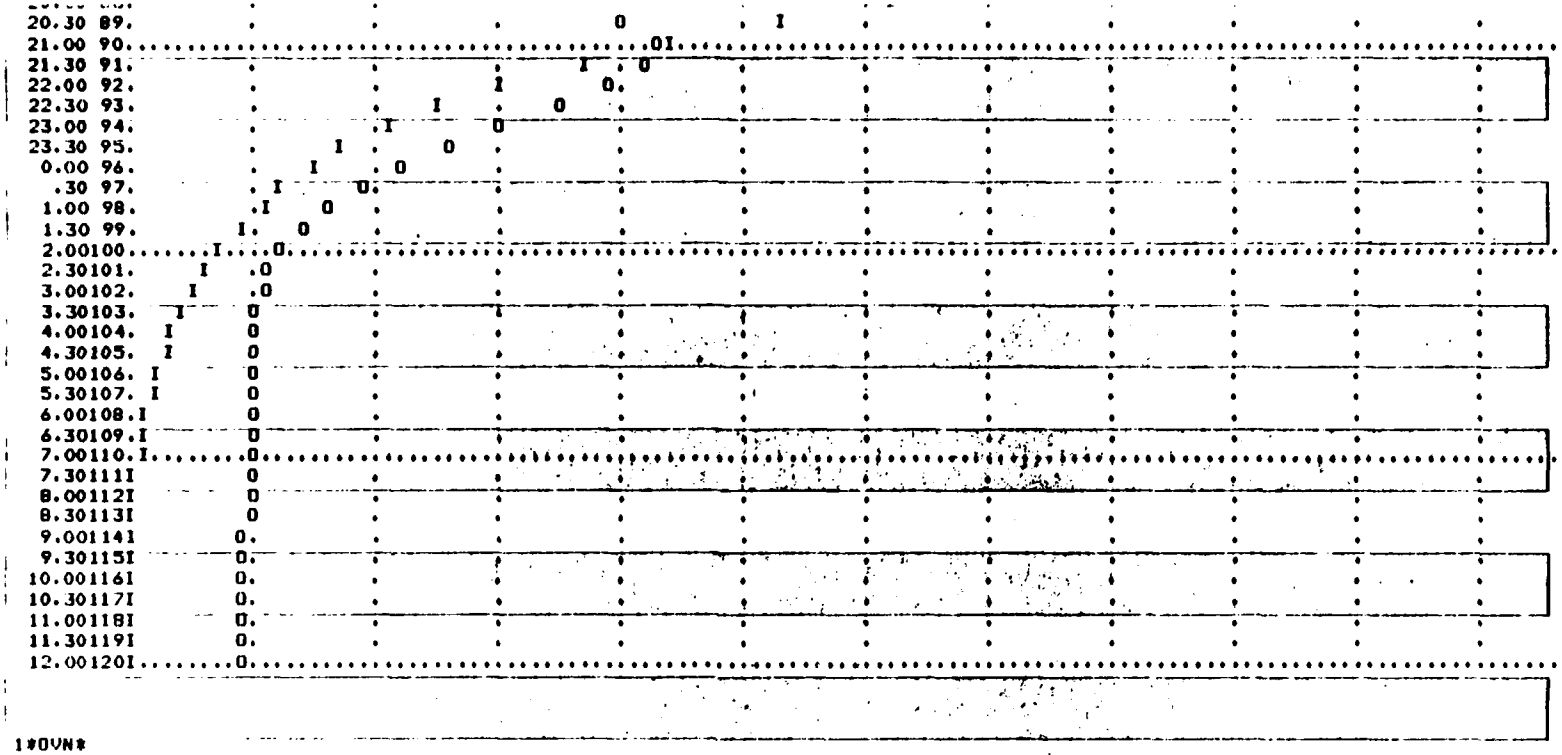
1HOUR 1

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0.	100.	200.	300.	400.	500.	600.	700.	800.	900.	0.	0.
.30	110	.	.	.	.	.	.	.	.	.	.	.
1.00	210	.	.	.	.	.	.	.	.	.	.	.
1.30	310	.	.	.	.	.	.	.	.	.	.	.
2.00	110	.	.	.	.	.	.	.	.	.	.	.
2.30	21	.	.	.	.	.	.	.	.	.	.	.
3.00	81	.	.	.	.	.	.	.	.	.	.	.
3.30	21	.	.	.	.	.	.	.	.	.	.	.
4.00	81	.	.	.	.	.	.	.	.	.	.	.
4.30	21	.	.	.	.	.	.	.	.	.	.	.
5.00	101	.	.	.	.	.	.	.	.	.	.	.
5.30	111	.	.	.	.	.	.	.	.	.	.	.
6.00	131	.	.	.	.	.	.	.	.	.	.	.
6.30	151	.	.	.	.	.	.	.	.	.	.	.
7.00	111	.	.	.	.	.	.	.	.	.	.	.
7.30	151	.	.	.	.	.	.	.	.	.	.	.
8.00	131	.	.	.	.	.	.	.	.	.	.	.
8.30	131	.	.	.	.	.	.	.	.	.	.	.
9.00	151	.	.	.	.	.	.	.	.	.	.	.
9.30	131	.	.	.	.	.	.	.	.	.	.	.
10.00	21	.	.	.	.	.	.	.	.	.	.	.





1*DUMN*

STATION 1, PLAN 1, RATIO 3

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

6.	6.	5.	5.	5.	5.	5.	4.	4.	4.
4.	4.	4.	4.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	2.	2.	2.	2.	2.
2.	2.	2.	3.	3.	4.	5.	5.	6.	7.
7.	8.	8.	8.	8.	8.	8.	8.	8.	7.
7.	7.	7.	7.	7.	8.	8.	8.	8.	9.
9.	9.	10.	11.	12.	13.	15.	16.	18.	20.
22.	23.	25.	27.	30.	34.	39.	46.	53.	62.
72.	82.	93.	104.	454.	724.	863.	910.	894.	837.
755.	665.	574.	490.	415.	350.	295.	248.	209.	176.
148.	123.	106.	105.	105.	104.	103.	103.	102.	101.
109.	99.	98.	97.	96.	95.	94.	93.	92.	91.

STORAGE

5.	5.	4.	4.	4.	4.	4.	4.	4.	3.
3.	3.	3.	3.	3.	3.	3.	3.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	3.	4.	4.	5.	6.
6.	6.	7.	7.	7.	7.	7.	7.	6.	6.
6.	6.	7.	6.	6.	6.	7.	7.	7.	8.
8.	8.	9.	9.	10.	12.	13.	15.	17.	19.
	24.	26.	28.	33.	41.	48.	60.	75.	95.
				211.	296.	309.	314.	311.	307.

44.	242.	240.	[illegible]	[illegible]	232.	229.	226.	222.	218.
215.	[illegible]	[illegible]	203.	199.	195.	191.	188.	184.	180.

STAGE

1243.6	1243.6	1243.5	1243.5	1243.5	1243.4	1243.4	1243.4	1243.3	1243.3
1243.3	1243.3	1243.2	1243.2	1243.2	1243.2	1243.1	1243.1	1243.1	1243.1
1243.1	1243.0	1243.0	1243.0	1243.0	1243.0	1243.0	1242.9	1242.9	1242.9
1242.9	1242.9	1242.9	1243.0	1243.1	1243.2	1243.4	1243.5	1243.7	1243.8
1243.9	1244.0	1244.0	1244.0	1244.0	1244.0	1244.0	1244.0	1244.0	1243.9
1243.9	1243.9	1243.9	1243.9	1243.9	1244.0	1244.0	1244.1	1244.1	1244.2
1244.3	1244.3	1244.4	1244.6	1244.8	1245.0	1245.3	1245.6	1246.0	1246.3
1246.7	1247.0	1247.4	1247.8	1248.3	1249.1	1250.1	1251.4	1252.8	1254.5
1256.3	1258.4	1260.5	1262.6	1264.4	1265.4	1266.0	1266.1	1266.1	1265.9
1265.5	1265.2	1264.8	1264.5	1264.2	1264.0	1263.7	1263.6	1263.4	1263.3
1263.2	1263.1	1263.0	1262.9	1262.8	1262.6	1262.5	1262.3	1262.2	1262.0
1261.8	1261.6	1261.4	1261.2	1261.0	1260.8	1260.6	1260.4	1260.2	1260.0

PEAK OUTFLOW IS 910. AT TIME 44.00 HOURS

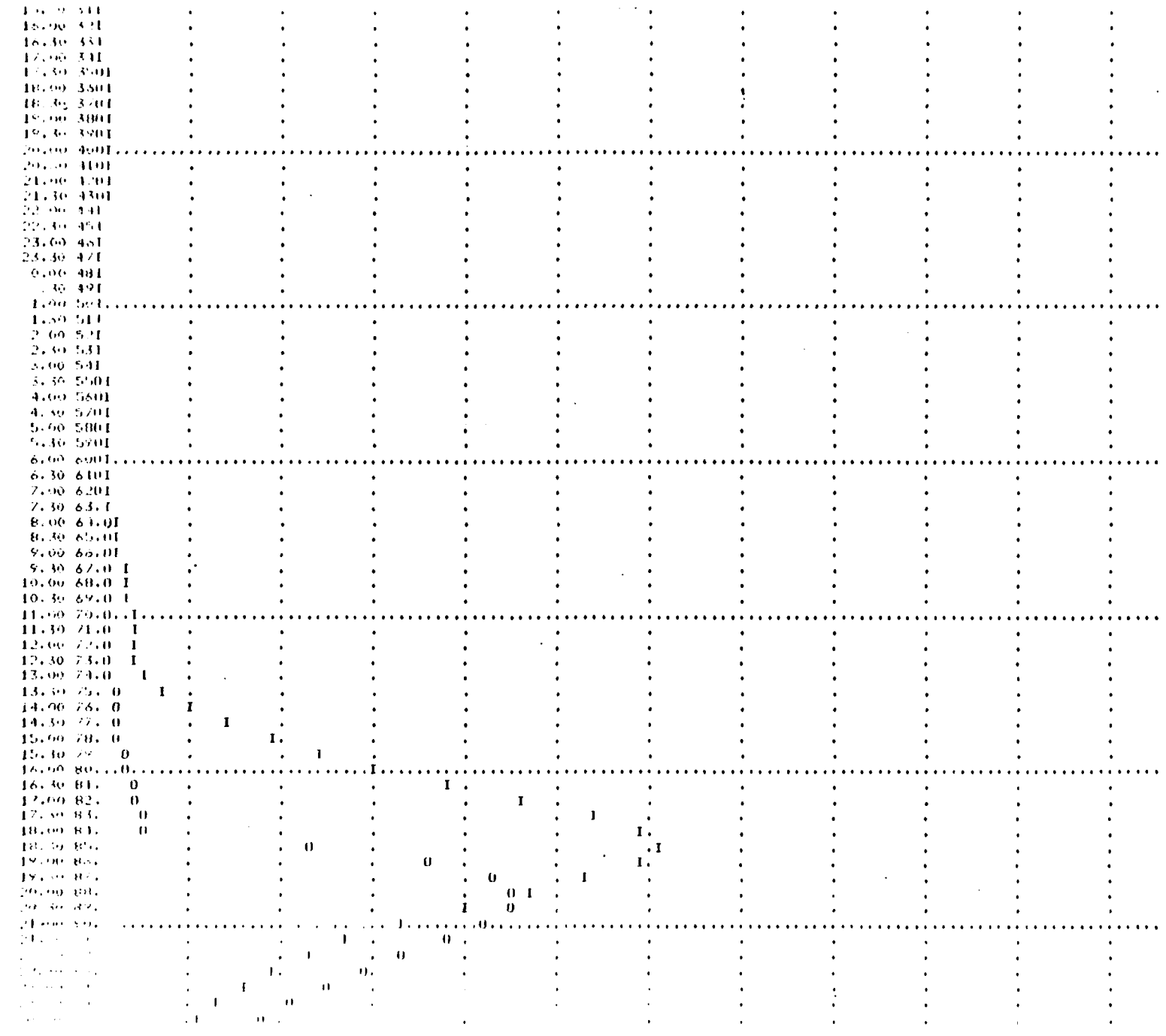
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	910.	654.	240.	100.	12008.
CMS	26.	19.	7.	3.	340.
INCHES		3.80	5.59	5.82	5.82
MM		96.61	142.05	147.77	147.77
AC-FT		324.	477.	496.	496.
THOUS CU M		400.	588.	612.	612.

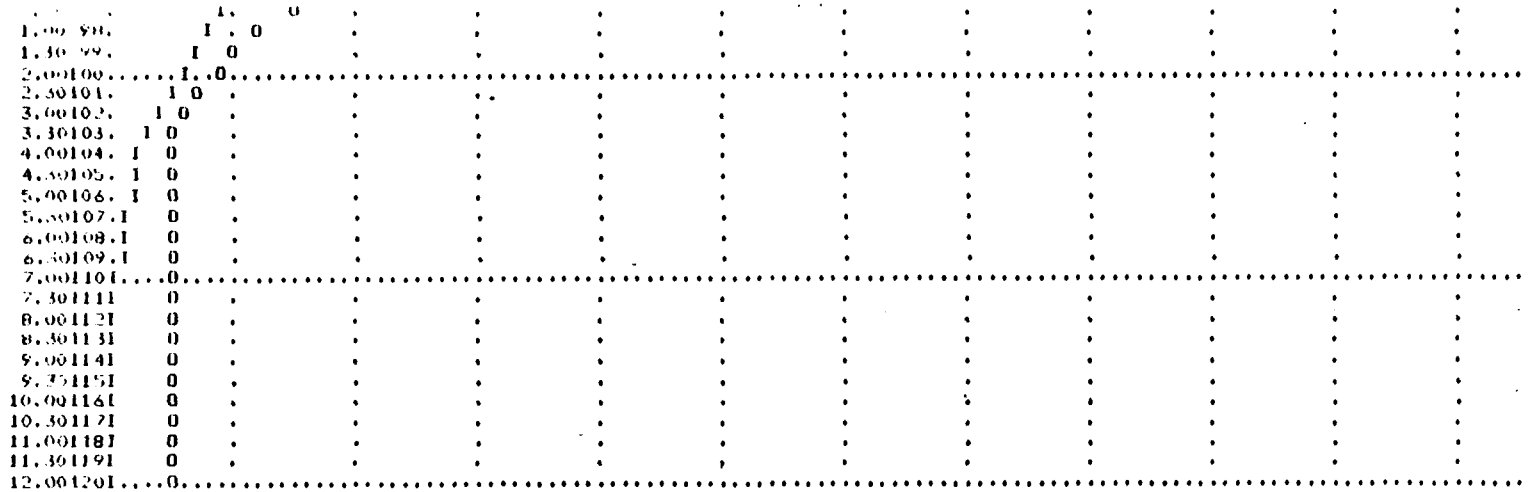
140PE*

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0.	200.	400.	600.	800.	1000.	1200.	1400.	0.	0.	0.	0.
.30	11	.	.	.	.	.	.	.	.	.	.	.
1.00	21	.	.	.	.	.	.	.	.	.	.	.
1.30	31	.	.	.	.	.	.	.	.	.	.	.
2.00	41	.	.	.	.	.	.	.	.	.	.	.
2.30	51	.	.	.	.	.	.	.	.	.	.	.
3.00	61	.	.	.	.	.	.	.	.	.	.	.
3.30	71	.	.	.	.	.	.	.	.	.	.	.
4.00	81	.	.	.	.	.	.	.	.	.	.	.
4.30	91	.	.	.	.	.	.	.	.	.	.	.
5.00	101	.	.	.	.	.	.	.	.	.	.	.
5.30	111	.	.	.	.	.	.	.	.	.	.	.
6.00	121	.	.	.	.	.	.	.	.	.	.	.
6.30	131	.	.	.	.	.	.	.	.	.	.	.
7.00	141	.	.	.	.	.	.	.	.	.	.	.
7.30	151	.	.	.	.	.	.	.	.	.	.	.
8.00	161	.	.	.	.	.	.	.	.	.	.	.
8.30	171	.	.	.	.	.	.	.	.	.	.	.
9.00	181	.	.	.	.	.	.	.	.	.	.	.
9.30	191	.	.	.	.	.	.	.	.	.	.	.
10.00	201	.	.	.	.	.	.	.	.	.	.	.
10.30	211	.	.	.	.	.	.	.	.	.	.	.
11.00	221	.	.	.	.	.	.	.	.	.	.	.
11.30	231	.	.	.	.	.	.	.	.	.	.	.
12.00	241	.	.	.	.	.	.	.	.	.	.	.
12.30	251	.	.	.	.	.	.	.	.	.	.	.
13.00	261	.	.	.	.	.	.	.	.	.	.	.
13.30	271	.	.	.	.	.	.	.	.	.	.	.
14.00	281	.	.	.	.	.	.	.	.	.	.	.
14.30	291	.	.	.	.	.	.	.	.	.	.	.
15.00	301	.	.	.	.	.	.	.	.	.	.	.
15.30	311	.	.	.	.	.	.	.	.	.	.	.





1♦DUN♦

STATION 1, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

6.	6.	5.	5.	5.	5.	5.	5.	4.	4.
4.	4.	4.	4.	4.	4.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	2.
2.	2.	3.	3.	4.	5.	6.	7.	8.	9.
9.	10.	10.	10.	10.	10.	10.	10.	10.	10.
9.	9.	9.	9.	10.	10.	10.	11.	11.	11.
12.	12.	13.	14.	15.	17.	19.	21.	23.	25.
27.	29.	32.	34.	38.	42.	48.	56.	65.	74.
85.	97.	254.	719.	1028.	1390.	1464.	1364.	1206.	1058.
973.	867.	757.	651.	554.	469.	395.	333.	281.	236.
198.	165.	136.	112.	106.	105.	104.	104.	103.	102.
101.	100.	99.	98.	97.	96.	95.	94.	93.	92.

STORAGE

5.	5.	5.	4.	4.	4.	4.	4.	4.	4.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	3.	4.	5.	6.	7.	7.
8.	8.	9.	9.	9.	9.	9.	9.	9.	8.
8.	8.	8.	8.	8.	9.	9.	9.	10.	10.
11.	11.	12.	13.	14.	16.	18.	21.	23.	26.
29.	32.	36.	40.	45.	53.	65.	81.	102.	128.
162.	205.	253.	295.	326.	342.	344.	341.	335.	329.
320.	310.	299.	289.	280.	272.	265.	260.	255.	251.
248.	245.	243.	241.	239.	236.	233.	230.	227.	223.
219.	215.	212.	208.	204.	200.	196.	192.	189.	185.

STAGE

1243.6	1243.6	1243.6	1243.5	1243.5	1243.5	1243.4	1243.4	1243.4	1243.3
1243.3	1243.3	1243.3	1243.2	1243.2	1243.2	1243.2	1243.1	1243.1	1243.1
1243.1	1243.1	1243.1	1243.0	1243.0	1243.0	1243.0	1243.0	1243.0	1243.0
1243.0	1243.0	1243.0	1243.1	1243.2	1243.3	1243.5	1243.8	1244.0	1244.2

1244.3	1244.3	1244.3	1244.3	1244.4	1244.4	1244.5	1244.5	1244.6	1244.7
1244.8	1244.9	1245.0	1245.2	1245.4	1245.7	1246.1	1246.5	1246.9	1247.3
1247.8	1248.2	1248.6	1249.1	1249.8	1250.7	1251.8	1253.3	1255.0	1256.9
1259.0	1261.3	1263.6	1265.4	1266.6	1267.2	1267.3	1267.2	1267.0	1266.7
1266.4	1266.0	1265.5	1265.1	1264.7	1264.4	1264.1	1263.9	1263.7	1263.5
1263.4	1263.2	1263.1	1263.0	1262.9	1262.8	1262.7	1262.5	1262.4	1262.2
1262.0	1261.8	1261.6	1261.4	1261.3	1261.1	1260.9	1260.7	1260.5	1260.3

PEAK OUTFLOW IS 1464. AT TIME 43.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1464.	992.	349.	144.	17310.
CMS	41.	28.	10.	4.	490.
INCHES		5.77	8.11	8.39	8.39
MM		146.52	206.00	213.02	213.02
AC-FT		492.	692.	715.	715.
THOUS CU M		607.	853.	882.	882.

1HOUR

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(#)

```
      0.      200.      400.      600.      800.     1000.     1200.     1400.     1600.     1800.        0.        0.
 .50  1I        .         .         .         .         .         .         .         .         .         .         .
1.00  2I        .         .         .         .         .         .         .         .         .         .         .
1.50  3I        .         .         .         .         .         .         .         .         .         .         .
2.00  4I        .         .         .         .         .         .         .         .         .         .         .
2.50  5I        .         .         .         .         .         .         .         .         .         .         .
3.00  6I        .         .         .         .         .         .         .         .         .         .         .
3.50  7I        .         .         .         .         .         .         .         .         .         .         .
4.00  8I        .         .         .         .         .         .         .         .         .         .         .
4.50  9I        .         .         .         .         .         .         .         .         .         .         .
5.00 10I.....................................................................................................
5.50 11I        .         .         .         .         .         .         .         .         .         .         .
6.00 12I        .         .         .         .         .         .         .         .         .         .         .
6.50 13I        .         .         .         .         .         .         .         .         .         .         .
7.00 14I        .         .         .         .         .         .         .         .         .         .         .
7.50 15I        .         .         .         .         .         .         .         .         .         .         .
8.00 16I        .         .         .         .         .         .         .         .         .         .         .
8.50 17I        .         .         .         .         .         .         .         .         .         .         .
9.00 18I        .         .         .         .         .         .         .         .         .         .         .
9.50 19I        .         .         .         .         .         .         .         .         .         .         .
10.00 20I.....................................................................................................
10.50 21I       .         .         .         .         .         .         .         .         .         .         .
11.00 22I       .         .         .         .         .         .         .         .         .         .         .
11.50 23I       .         .         .         .         .         .         .         .         .         .         .
12.00 24I       .         .         .         .         .         .         .         .         .         .         .
12.50 25I       .         .         .         .         .         .         .         .         .         .         .
13.00 26I       .         .         .         .         .         .         .         .         .         .         .
13.50 27I       .         .         .         .         .         .         .         .         .         .         .
14.00 28I       .         .         .         .         .         .         .         .         .         .         .
14.50 29I       .         .         .         .         .         .         .         .         .         .         .
15.00 30I.....................................................................................................
15.50 31I       .         .         .         .         .         .         .         .         .         .         .
16.00 32I       .         .         .         .         .         .         .         .         .         .         .
16.50 33I       .         .         .         .         .         .         .         .         .         .         .
17.00 34I       .         .         .         .         .         .         .         .         .         .         .
17.50 35I       .         .         .         .         .         .         .         .         .         .         .
18.00 36I       .         .         .         .         .         .         .         .         .         .         .
18.50 37I       .         .         .         .         .         .         .         .         .         .         .
19.00 38I       .         .         .         .         .         .         .         .         .         .         .
      39I       .         .         .         .         .         .         .         .         .         .         .
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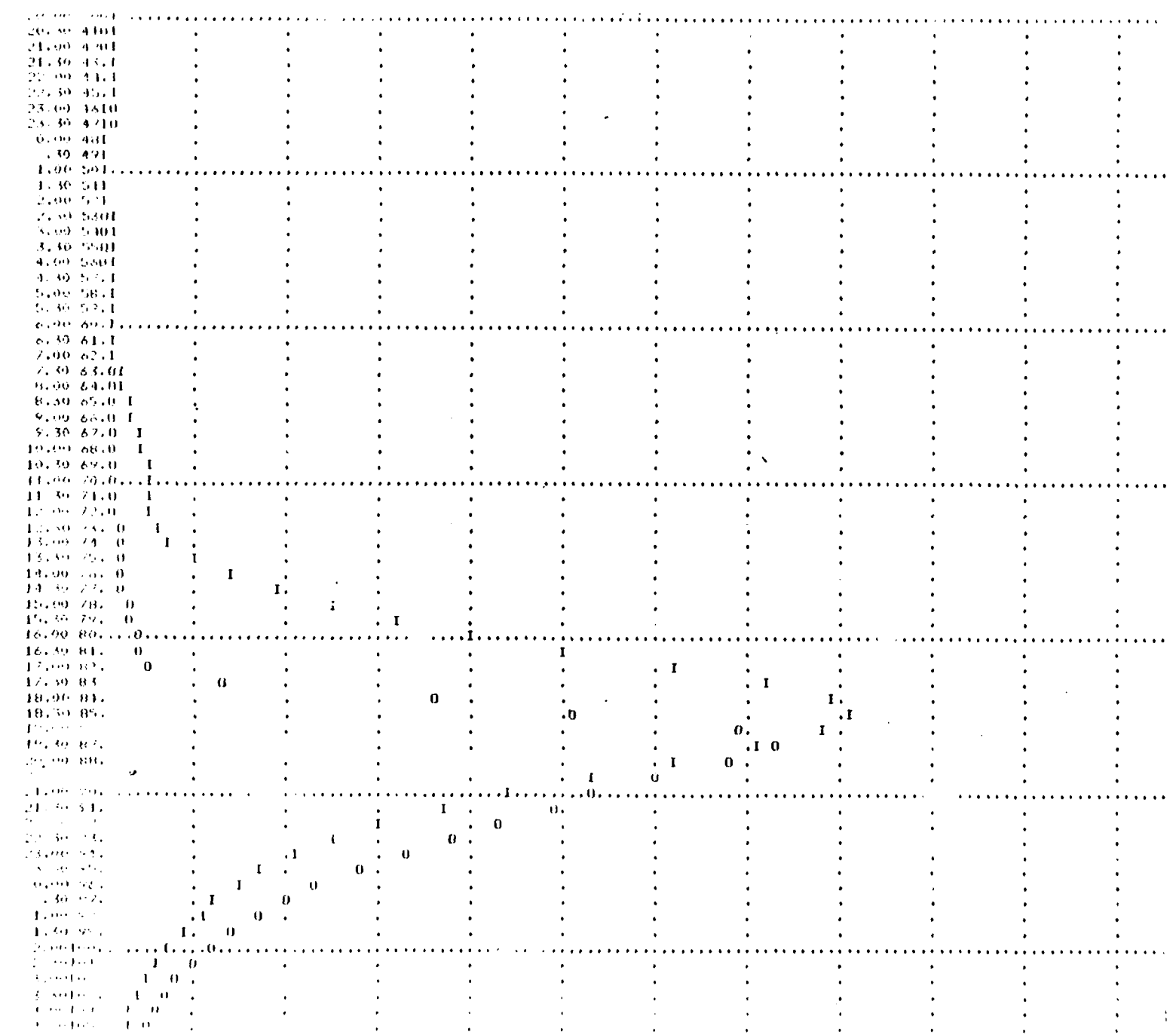
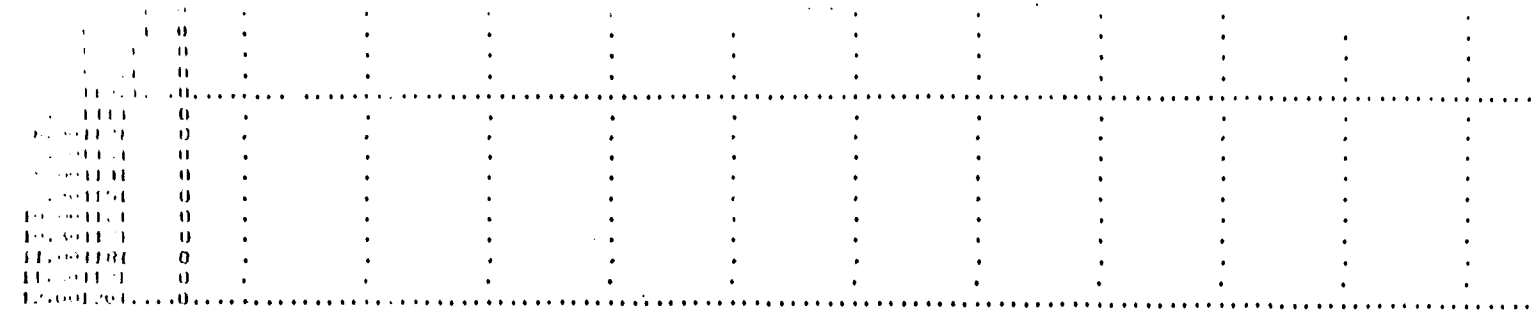




STATION 1, PLAN 1, RATIO 5

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

6.	6.	6.	5.	5.	5.	5.	5.	5.	4.
4.	4.	4.	4.	4.	4.	4.	4.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	4.	5.	7.	8.	9.	10.
11.	12.	12.	12.	12.	12.	12.	12.	12.	12.
12.	11.	11.	12.	12.	12.	13.	13.	13.	14.
14.	15.	16.	17.	18.	20.	23.	25.	27.	30.
33.	35.	38.	41.	44.	50.	56.	65.	75.	85.
97.	280.	790.	1275.	1815.	1947.	1886.	1722.	1515.	1294.
1083.	997.	891.	780.	673.	575.	489.	415.	350.	296.
248.	207.	171.	140.	114.	106.	105.	104.	104.	103.
102.	101.	100.	99.	98.	97.	96.	95.	94.	93.

STORAGE

5.	5.	5.	4.	4.	4.	4.	4.	4.	4.
4.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	3.	3.	4.	6.	7.	8.	9.
10.	10.	11.	11.	11.	11.	11.	11.	11.	11.
10.	10.	10.	10.	11.	11.	11.	12.	12.	13.
13.	14.	15.	16.	18.	20.	23.	26.	29.	33.
37.	41.	45.	50.	57.	67.	82.	102.	129.	162.
205.	255.	302.	338.	357.	361.	359.	353.	346.	338.
331.	323.	312.	301.	291.	282.	274.	267.	261.	257.
252.	249.	246.	243.	241.	239.	236.	233.	230.	227.
223.	219.	215.	211.	207.	204.	200.	196.	192.	188.

STAGE

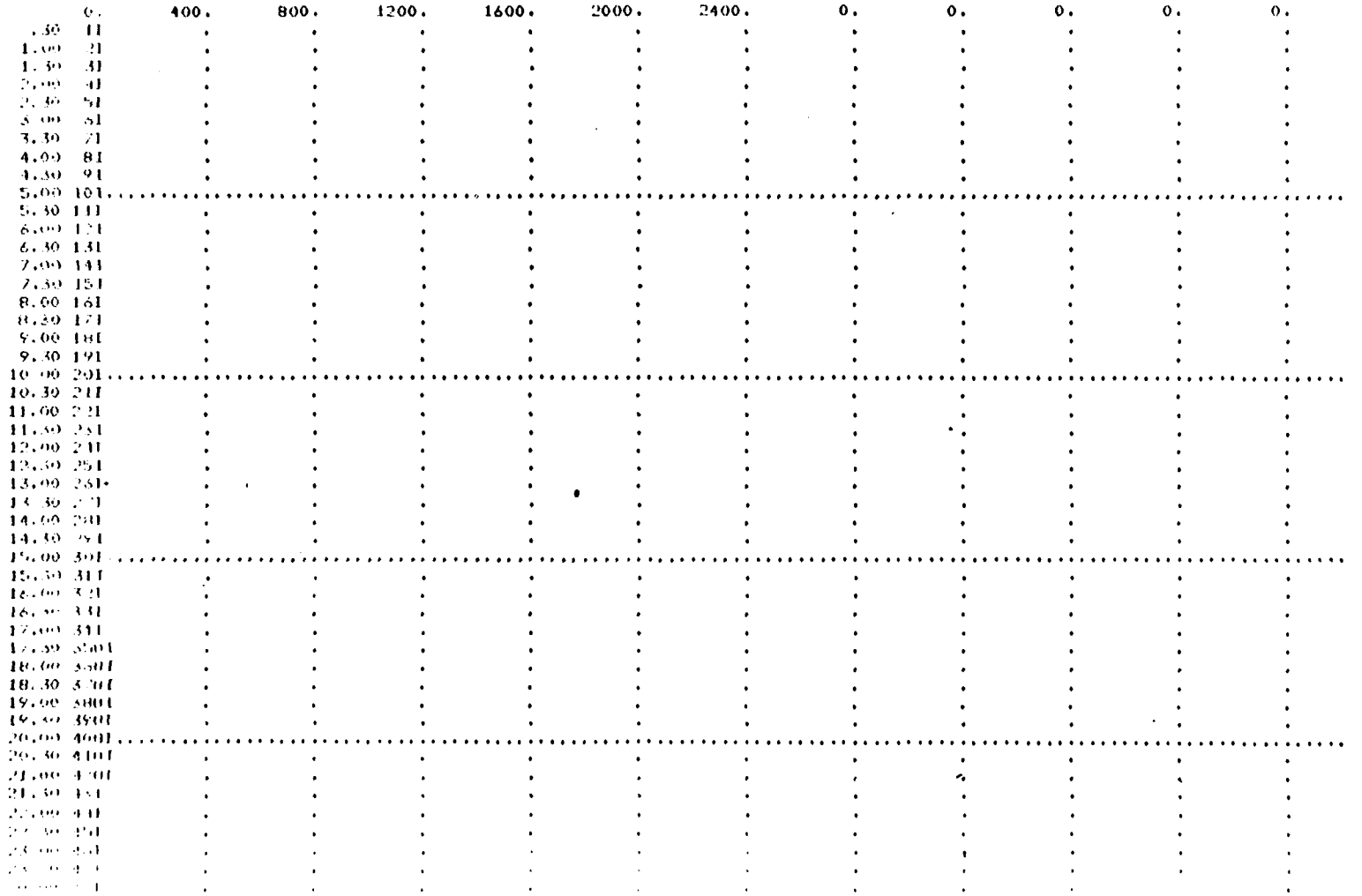
1243.6	1243.6	1243.6	1243.5	1243.5	1243.5	1243.4	1243.4	1243.4	1243.4
1243.3	1243.3	1243.3	1243.3	1243.2	1243.2	1243.2	1243.2	1243.2	1243.2
1243.1	1243.1	1243.1	1243.1	1243.1	1243.1	1243.1	1243.0	1243.0	1243.0
1243.0	1243.0	1243.1	1243.2	1243.3	1243.5	1243.8	1244.1	1244.3	1244.5
1244.7	1244.8	1244.8	1244.9	1244.9	1244.9	1244.9	1244.9	1244.8	1244.8
1244.7	1244.7	1244.7	1244.7	1244.8	1244.8	1244.9	1245.0	1245.1	1245.2
1245.3	1245.4	1245.6	1245.8	1246.1	1246.4	1246.9	1247.3	1247.8	1248.3
1248.8	1249.3	1249.8	1250.3	1250.8	1251.4	1252.1	1253.4	1255.0	1256.9
1261.3	1263.7	1265.7	1267.1	1267.8	1268.0	1267.9	1267.7	1267.4	1267.1
1266.8	1266.5	1266.1	1265.6	1265.2	1264.8	1264.5	1264.2	1264.0	1263.7
1263.6	1263.4	1263.3	1263.1	1263.0	1262.9	1262.8	1262.7	1262.5	1262.4
1262.2	1262.0	1261.8	1261.6	1261.4	1261.	1261.0	1260.8	1260.6	1260.4

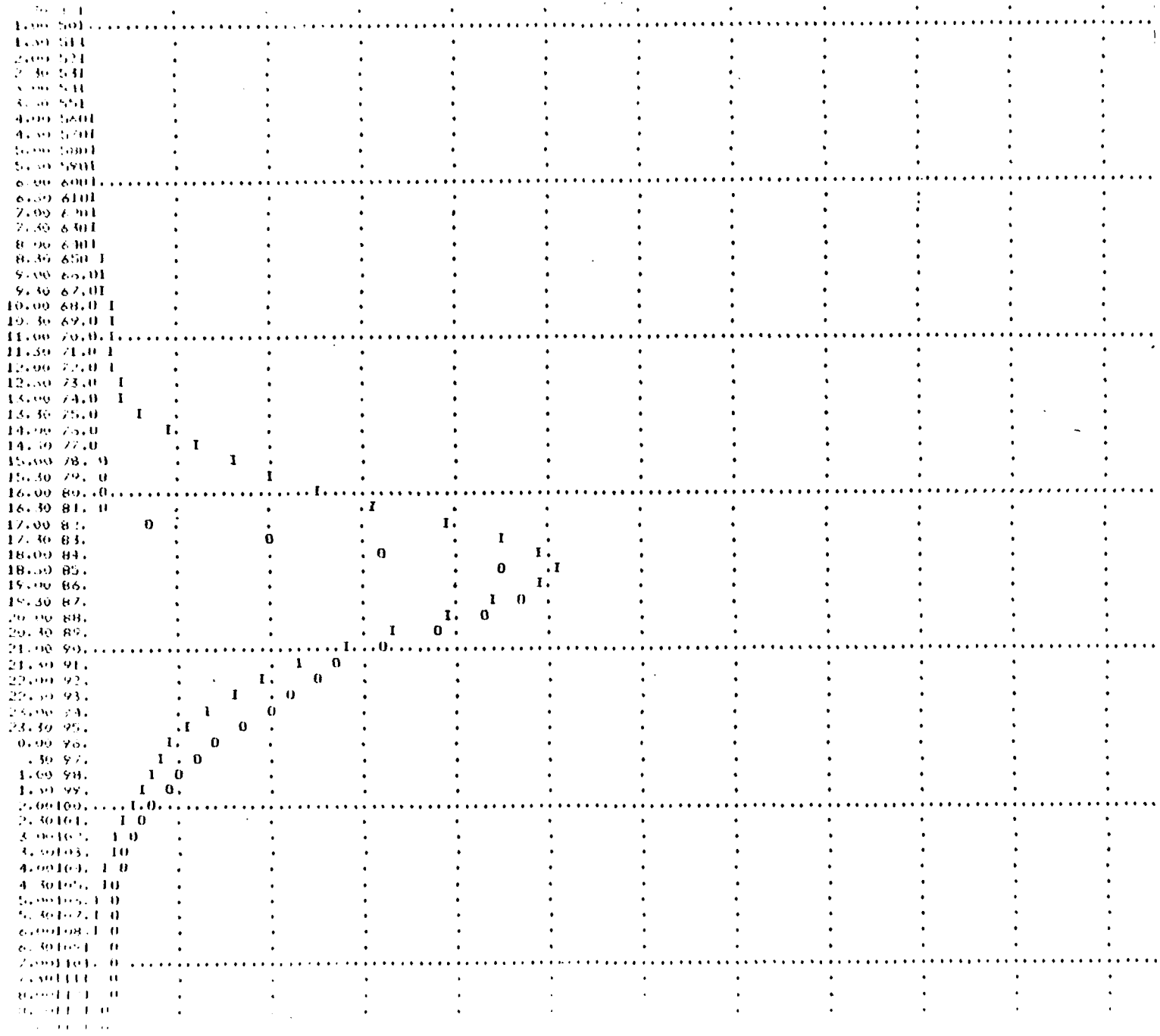
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1947.	1328.	458.	189.	22642.
CMS	55.	38.	13.	5.	641.
INCHES		7.72	10.64	10.97	10.97
CM		196.12	270.37	278.63	278.63
AC-FT		659.	908.	936.	936.
THOUS CU M		812.	1120.	1154.	1154.

HOPE1

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)





9.00 1151 0 . . . . . .
10.00 1161 0 . . . . . .
10.50 1171 0 . . . . . .
11.00 1181 0 . . . . . .
11.50 1191 0 . . . . . .
12.00 1201.0 . . . . . .

1 0 0 0 4

STATION 1, PLAN 1, RATIO 6

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

6.	6.	6.	5.	5.	5.	5.	5.	5.	5.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	4.	5.	6.	8.	9.	11.	12.
13.	14.	14.	14.	15.	15.	14.	14.	14.	14.
14.	14.	14.	14.	14.	14.	15.	15.	16.	16.
17.	18.	19.	20.	22.	24.	26.	29.	32.	35.
37.	40.	43.	46.	51.	56.	64.	73.	83.	95.
181.	738.	1291.	2008.	2298.	2368.	2273.	2072.	1822.	1557.
1302.	1079.	994.	889.	779.	674.	578.	493.	418.	354.
298.	249.	206.	169.	137.	111.	106.	105.	104.	103.
103.	102.	101.	100.	99.	98.	97.	96.	95.	94.

STORAGE

5.	5.	5.	4.	4.	4.	4.	4.	4.	4.
4.	4.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	2.	2.	2.
2.	2.	3.	3.	1.	5.	7.	8.	10.	11.
12.	13.	13.	13.	13.	13.	13.	13.	13.	13.
12.	12.	12.	13.	13.	13.	14.	14.	15.	16.
16.	17.	18.	20.	22.	24.	28.	31.	36.	40.
45.	50.	55.	61.	69.	82.	99.	124.	156.	196.
247.	297.	338.	364.	374.	377.	373.	366.	357.	347.
339.	331.	322.	312.	301.	291.	282.	274.	267.	262.
257.	252.	249.	245.	243.	241.	238.	236.	233.	229.
226.	222.	218.	214.	210.	206.	203.	199.	195.	191.

STAGE

1243.6	1243.6	1243.6	1243.5	1243.5	1243.5	1243.5	1243.4	1243.4	1243.4
1243.4	1243.3	1243.3	1243.3	1243.3	1243.3	1243.2	1243.2	1243.2	1243.2
1243.2	1243.2	1243.2	1243.1	1243.1	1243.1	1243.1	1243.1	1243.1	1243.1
1243.1	1243.1	1243.1	1243.2	1243.4	1243.7	1244.0	1244.3	1244.6	1244.8
1245.0	1245.1	1245.2	1245.3	1245.3	1245.3	1245.3	1245.3	1245.2	1245.2
1245.1	1245.1	1245.1	1245.1	1245.2	1245.3	1245.4	1245.5	1245.6	1245.7
1245.8	1245.9	1246.1	1246.4	1246.7	1247.1	1247.6	1248.1	1248.6	1249.2
1249.7	1250.3	1250.8	1251.5	1252.3	1253.4	1254.8	1256.6	1258.6	1260.9
1263.3	1265.5	1267.1	1268.0	1268.4	1268.5	1268.4	1268.1	1267.8	1267.4
1267.1	1266.8	1266.5	1266.1	1265.6	1265.2	1264.8	1264.5	1264.2	1264.0
1263.7	1263.6	1263.4	1263.2	1263.1	1263.0	1262.9	1262.8	1262.7	1262.5
1262.3	1262.1	1262.0	1261.8	1261.6	1261.4	1261.2	1261.0	1260.8	1260.6

PEAK OUTFLOW IS 2368. AT TIME 43.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2368.	1656.	567.	233.	27990.
CMS	67.	47.	16.	7.	793.
INCHES		9.23	13.19	13.56	13.56
MM		234.4	335.0	344.5	344.5

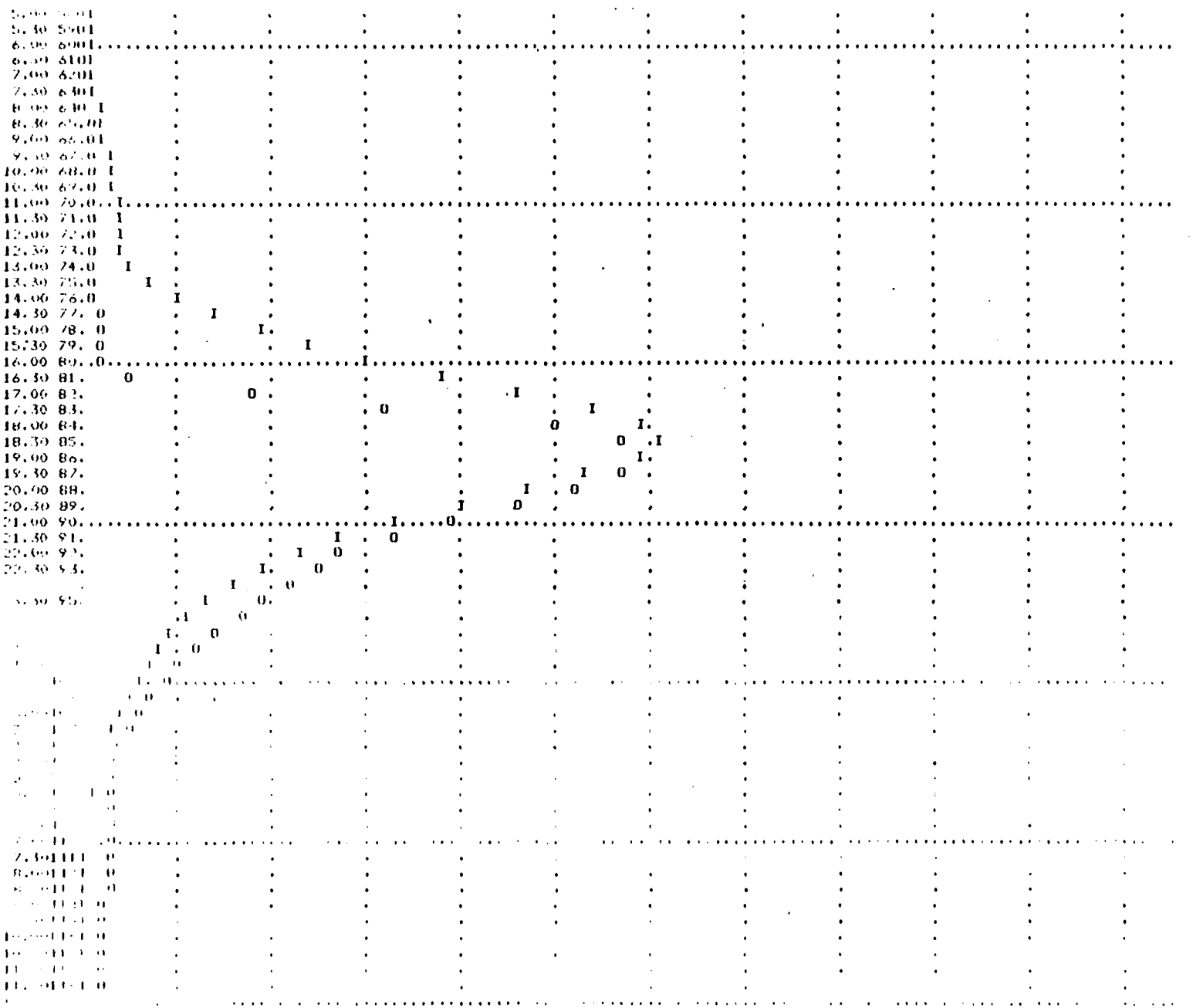
HOURS CODED 1015. 1307. 1427. 1427.

1009 1

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(#)

	0.	400.	800.	1200.	1600.	2000.	2400.	2800.	0.	0.	0.	0.
.50	11											
1.00	21											
1.50	31											
2.00	41											
2.50	51											
3.00	61											
3.50	71											
4.00	81											
4.50	91											
5.00	101											
5.50	111											
6.00	121											
6.50	131											
7.00	141											
7.50	151											
8.00	161											
8.50	171											
9.00	181											
9.50	191											
10.00	201											
10.50	211											
11.00	221											
11.50	231											
12.00	241											
12.50	251											
13.00	261											
13.50	271											
14.00	281											
14.50	291											
15.00	301											
15.50	311											
16.00	321											
16.50	331											
17.00	341											
17.50	351											
18.00	361											
18.50	371											
19.00	381											
19.50	391											
20.00	401											
20.50	411											
21.00	421											
21.50	431											
22.00	441											
22.50	451											
23.00	461											
23.50	471											
0.00	481											
.50	491											
1.00	501											
1.50	511											
2.00	521											
2.50	531											
3.00	541											
3.50	551											
4.00	561											



STATION 1, PLAN 1, RATIO 7

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

6.	6.	6.	5.	5.	5.	5.	5.	5.	
5.	4.	4.	4.	4.	4.	4.	4	4.	4.
4.	4.	4.	4.	3.	3.	3.	3.	3.	3
3.	3.	4.	4.	5.	7.	9.	11.	12.	14.
15.	16.	16.	16.	17.	17.	16.	16.	16.	16.
16.	16.	16.	16.	16.	16.	17.	18.	18.	19.
20.	20.	21.	23.	25.	27.	30.	33.	36.	39.
42.	45.	48.	52.	56.	62.	70.	80.	91.	104.
578.	1064.	1988.	2462.	2710.	2770.	2655.	2421.	2130.	1820.
1523.	1261.	1063.	974.	870.	762.	660.	567.	484.	411.
347.	290.	240.	197.	161.	130.	106.	105.	105.	104.
103.	102.	101.	100.	99.	98.	97.	96.	95.	94.

STORAGE

5.	5.	5.	5.	4.	4.	4.	4.	4.	4.
4.	4.	4.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	4.	6.	8.	9.	11.	13.
14.	15.	15.	15.	16.	16.	16.	15.	15.	15.
15.	15.	15.	15.	15.	16.	16.	17.	18.	18.
19.	20.	21.	23.	26.	29.	33.	37.	42.	47.
53.	58.	65.	72.	82.	96.	117.	146.	183.	231.
282.	329.	363.	380.	390.	392.	388.	379.	368.	357.
346.	337.	329.	320.	310.	299.	290.	281.	273.	267.
261.	256.	252.	248.	245.	242.	240.	238.	235.	231.
228.	224.	220.	217.	213.	209.	205.	201.	197.	194.

STAGE

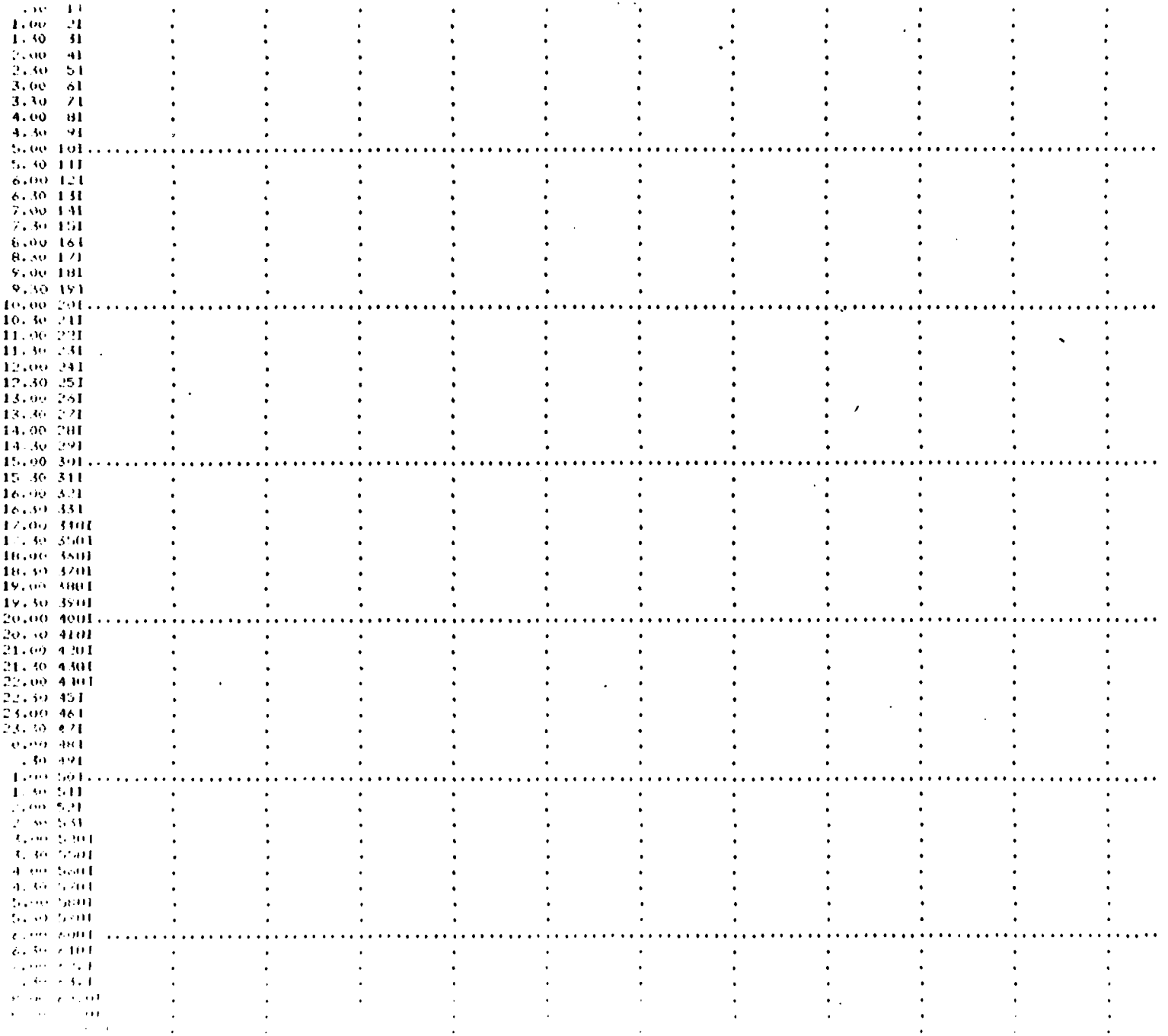
1243.6	1243.6	1243.6	1243.6	1243.5	1243.5	1243.5	1243.4	1243.4	1243.4
1243.4	1243.4	1243.3	1243.3	1243.3	1243.3	1243.3	1243.3	1243.2	1243.2
1243.2	1243.2	1243.2	1243.2	1243.2	1243.2	1243.2	1243.1	1243.1	1243.1
1243.1	1243.1	1243.2	1243.3	1243.5	1243.9	1244.2	1244.6	1244.9	1245.2
1245.4	1245.5	1245.6	1245.7	1245.7	1245.7	1245.7	1245.7	1245.6	1245.6
1245.5	1245.5	1245.5	1245.5	1245.6	1245.7	1245.8	1245.9	1246.0	1246.1
1246.3	1246.4	1246.6	1246.9	1247.3	1247.7	1248.2	1248.8	1249.4	1250.0
1250.6	1251.2	1251.8	1252.5	1253.4	1254.6	1256.1	1258.0	1260.2	1262.6
1264.8	1266.7	1268.0	1268.6	1269.0	1269.0	1268.9	1268.6	1268.2	1267.8
1267.4	1267.0	1266.7	1266.4	1266.0	1265.6	1265.2	1264.8	1264.5	1264.2
1263.9	1263.7	1263.5	1263.4	1263.2	1263.1	1263.0	1262.9	1262.8	1262.6
1262.4	1262.3	1262.1	1261.9	1261.7	1261.5	1261.3	1261.1	1260.9	1260.7

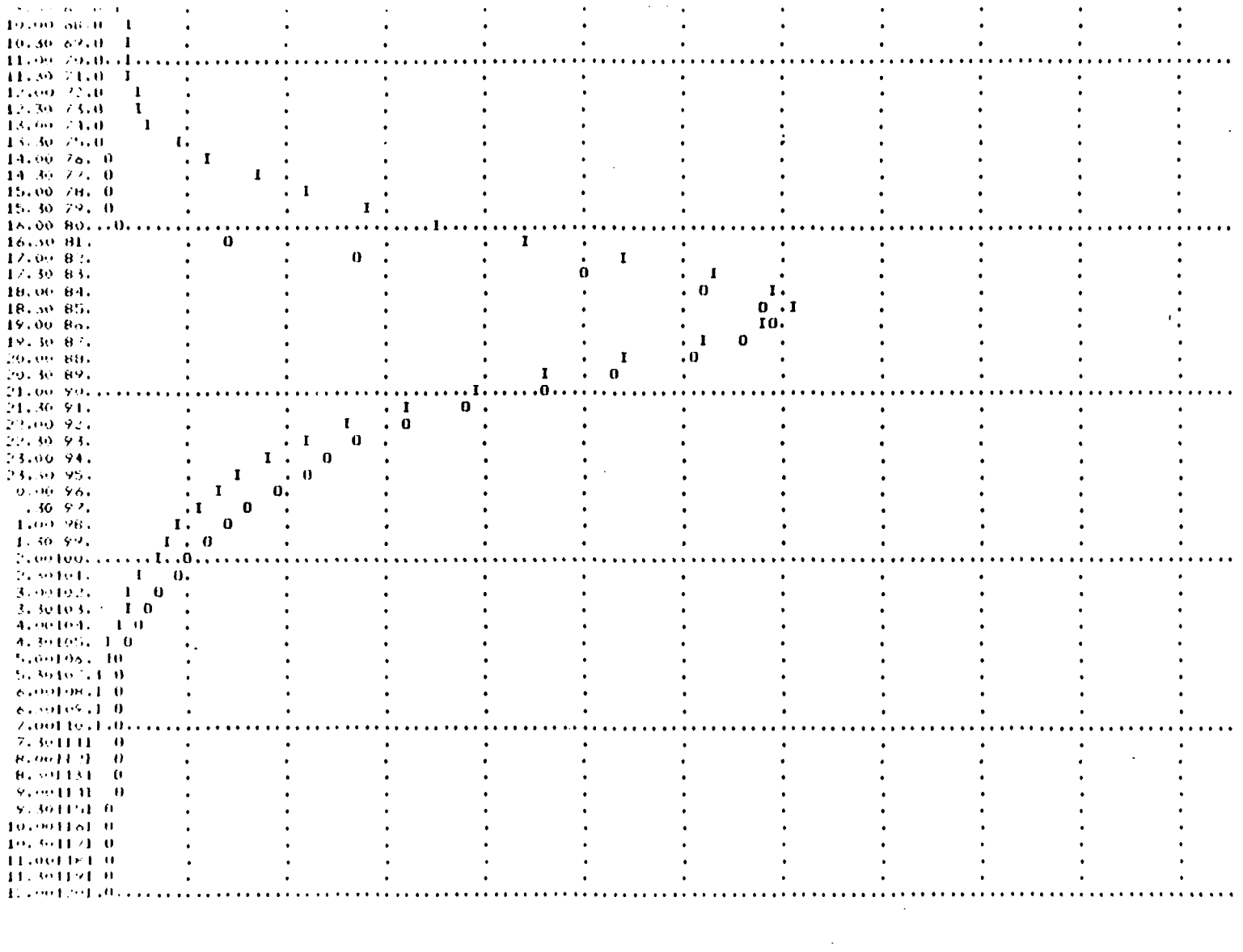
PEAK OUTFLOW IS 2770. AT TIME 43.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2770.	1985.	677.	278.	33348.
CMS	78.	56.	19.	8.	944.
INCHES		11.54	15.74	16.16	16.16
MM		293.16	399.77	410.39	410.39
AC-FT		984.	1342.	1378.	1378.
THOUS CU M		1214.	1656.	1700.	1700.

END OF RUN

STATION 1





STATION 1, PLAN 1, RATIO 0

END-OF-PERIOD HYDROGRAPH ORDINATES

3.	3.	3.	3.	4.	4.	4.	4.	4.	4.
4.	4.	4.	5.	6.	8.	10.	12.	14.	15.
17.	17.	18.	18.	18.	19.	18.	18.	18.	18.
18.	17.	18.	18.	18.	19.	19.	20.	20.	21.
22.	23.	24.	25.	28.	30.	33.	36.	40.	43.
46.	50.	53.	57.	62.	68.	77.	87.	99.	346.
874.	1651.	2395.	2842.	3102.	3166.	3036.	2771.	2439.	2085.
1745.	1444.	1193.	1038.	946.	841.	736.	637.	548.	467.
395.	331.	275.	226.	184.	149.	120.	106.	105.	104.
103.	103.	102.	101.	100.	99.	98.	97.	96.	95.

STORAGE

5.	5.	5.	5.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	4.	5.	7.	9.	11.	13.	14.
16.	17.	17.	18.	18.	18.	18.	18.	17.	17.
17.	17.	17.	17.	17.	18.	19.	19.	20.	21.
22.	23.	25.	27.	30.	33.	38.	43.	48.	55.
61.	68.	75.	83.	94.	111.	135.	168.	211.	261.
310.	351.	378.	395.	405.	407.	402.	392.	380.	366.
354.	344.	335.	327.	317.	307.	297.	288.	279.	272.
265.	260.	255.	250.	247.	244.	241.	239.	236.	233.
230.	226.	222.	218.	215.	211.	207.	203.	199.	195.

STAGE

1243.6	1243.6	1243.6	1243.6	1243.5	1243.5	1243.5	1243.5	1243.4	1243.4
1243.4	1243.4	1243.4	1243.4	1243.3	1243.3	1243.3	1243.3	1243.3	1243.3
1243.3	1243.2	1243.2	1243.2	1243.2	1243.2	1243.2	1243.2	1243.2	1243.2
1243.2	1243.2	1243.3	1243.4	1243.7	1244.0	1244.4	1244.8	1245.2	1245.5
1245.7	1245.9	1246.0	1246.0	1246.1	1246.1	1246.1	1246.0	1246.0	1245.9
1245.9	1245.9	1245.9	1245.9	1246.0	1246.1	1246.2	1246.3	1246.5	1246.6
1246.7	1246.9	1247.1	1247.4	1247.8	1248.3	1248.9	1249.5	1250.2	1250.8
1251.5	1252.1	1252.8	1253.5	1254.4	1255.7	1257.3	1259.3	1261.6	1263.9
1266.0	1267.6	1268.5	1269.1	1269.5	1269.6	1269.4	1269.0	1268.6	1268.1
1267.7	1267.3	1266.9	1266.6	1266.3	1265.9	1265.5	1265.1	1264.7	1264.4
1264.1	1263.9	1263.7	1263.5	1263.3	1263.2	1263.1	1262.9	1262.8	1262.7
1262.5	1262.3	1262.2	1262.0	1261.8	1261.6	1261.4	1261.2	1261.0	1260.8

PEAK OUTFLOW IS 3166. AT TIME 43.00 HOURS

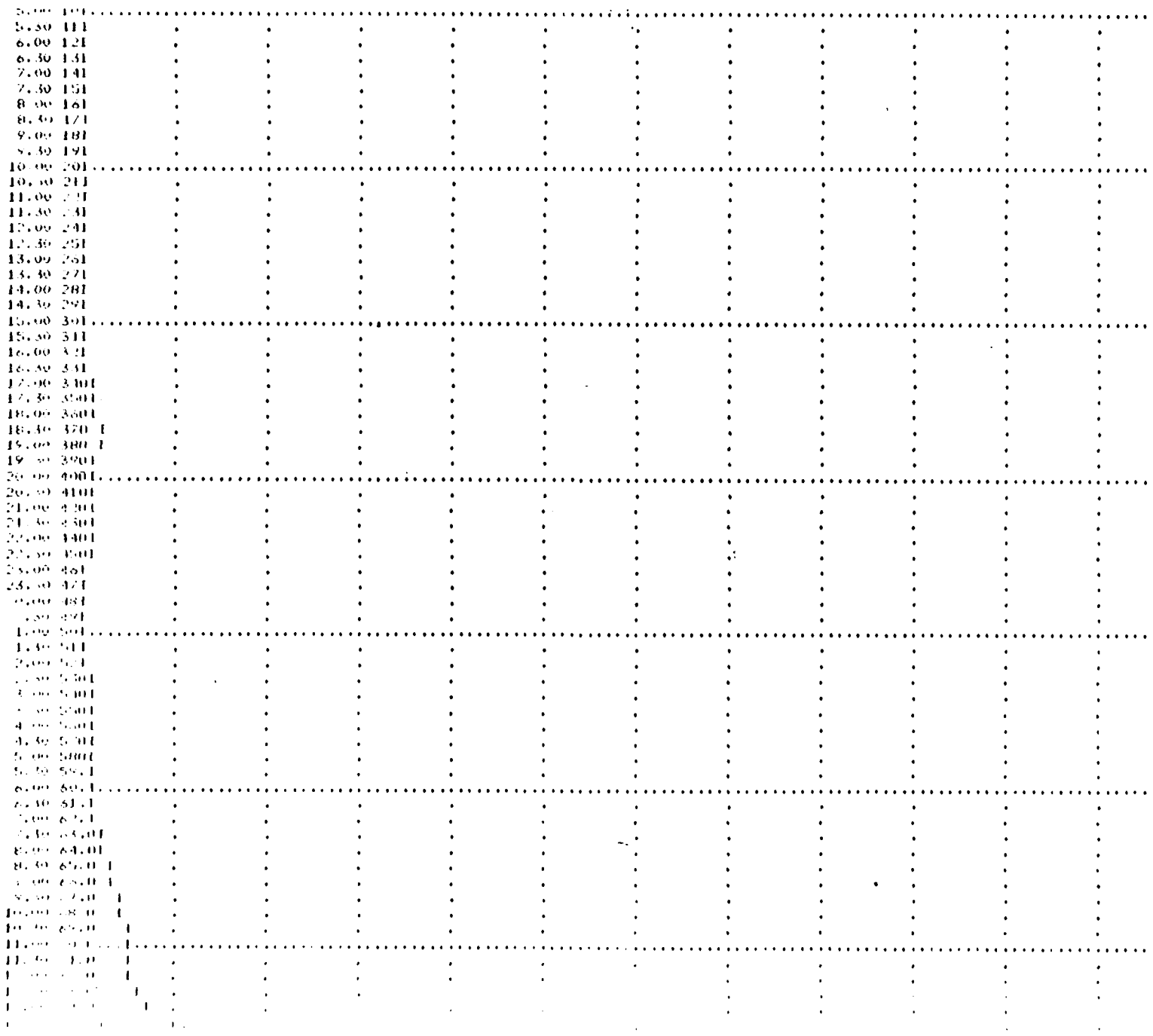
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3166.	2309.	787.	323.	38718.
CMS	90.	65.	22.	9.	1096.
INCHES		13.42	18.30	18.76	18.76
MM		340.98	464.75	476.48	476.48
AC-FT		1145.	1561.	1600.	1600.
THOUS CU M		1412.	1925.	1973.	1973.

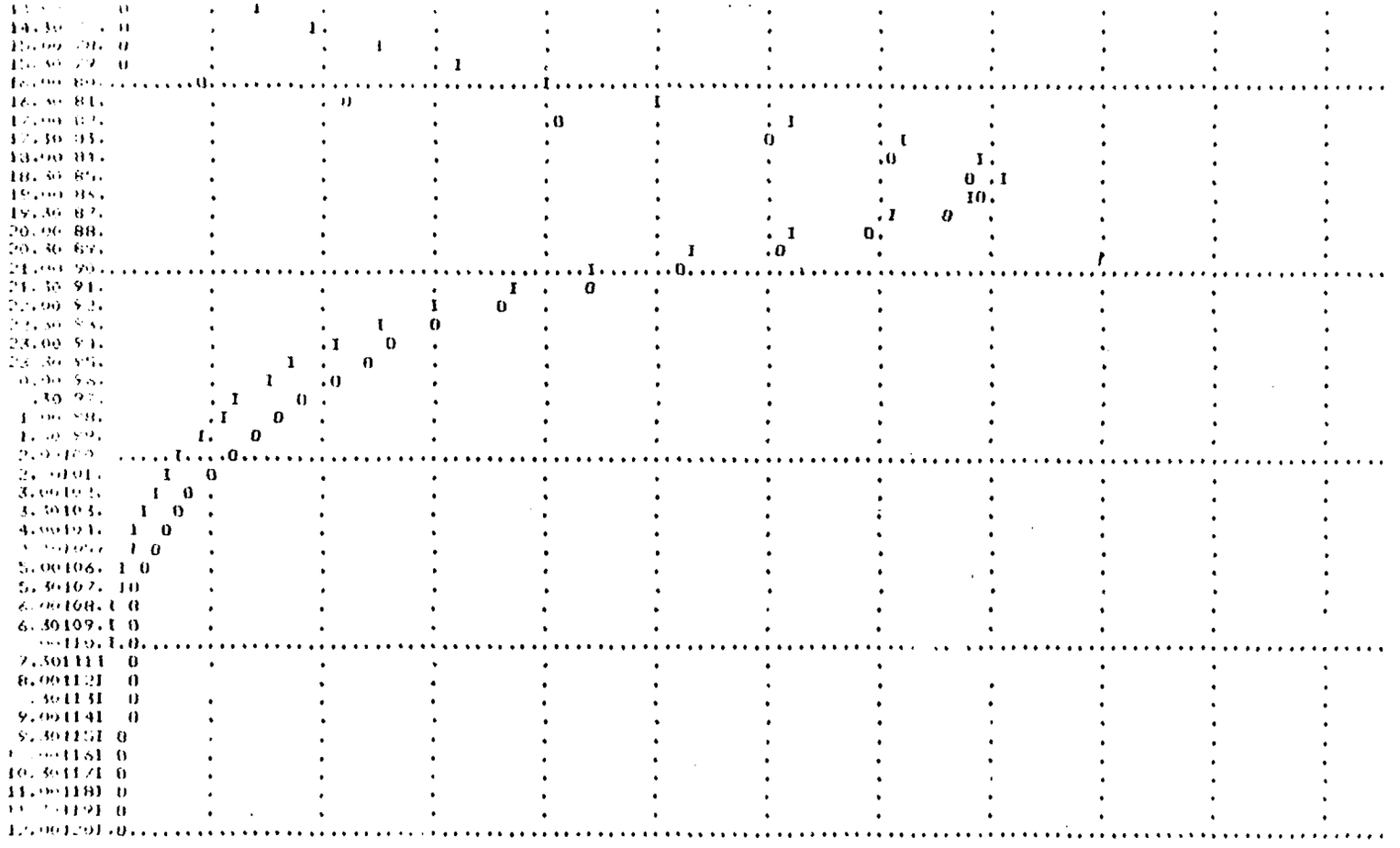
1

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

0.	400.	800.	1200.	1600.	2000.	2400.	2800.	3200.	3600.	0.	0.
[illegible]	.	.	.	.	.	.	.	.	.	.	.
[illegible]	.	.	.	.	.	.	.	.	.	.	.
[illegible]	.	.	.	.	.	.	.	.	.	.	.
[illegible]	.	.	.	.	.	.	.	.	.	.	.
[illegible]	.	.	.	.	.	.	.	.	.	.	.
[illegible]	.	.	.	.	.	.	.	.	.	.	.
[illegible]	.	.	.	.	.	.	.	.	.	.	.
[illegible]	.	.	.	.	.	.	.	.	.	.	.
[illegible]	.	.	.	.	.	.	.	.	.	.	.





STATION 1, PLOT 1, RATIO 9

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

6.	6.	.	6.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	5.	6.	7.	9.	12.	14.	17.	18.
20.	21.	22.	23.	22.	22.	22.	22.	22.	22.
21.	21.	21.	22.	22.	22.	23.	24.	25.	26.
27.	28.	29.	31.	33.	36.	39.	43.	47.	51.
54.	58.		66.	74.	83.	88.	99.	360.	875.
1450.	2185.	2893.	3469.	3879.	4093.	4138.	4123.	3961.	3619.
3175.	2813.	2472.	2153.	1864.	1611.	1391.	1201.	1036.	894.
771.	665.	573.	494.	426.	367.	317.	273.	236.	203.

STORAGE

5.	5.	5.	5.	5.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	4.	5.	6.	8.	11.	13.	16.	18.
19.	21.	22.	22.	22.	23.	22.	22.	22.	22.
21.	21.	21.	22.	22.	23.	24.	25.	26.	27.
28.	30.	31.	34.	38.	42.	48.	54.	62.	69.
77.	86.	95.	106.	120.	141.	172.	213.	262.	310.
351.	381.	404.	423.	435.	438.	432.	419.	403.	386.
370.	357.	345.	336.	329.	320.	310.	300.	290.	282.
274.	267.	261.	255.	251.	247.	244.	241.	239.	236.
232.	229.	225.	221.	218.	214.	210.	206.	202.	199.

STAGE

1243.7	1243.6	1243.6	1243.6	1243.6	1243.5	1243.5	1243.5	1243.5	1243.5
1243.5	1243.4	1243.4	1243.4	1243.4	1243.4	1243.4	1243.4	1243.4	1243.4
1243.3	1243.3	1243.3	1243.3	1243.3	1243.3	1243.3	1243.3	1243.3	1243.3
1243.3	1243.3	1243.4	1243.6	1243.9	1244.3	1244.8	1245.3	1245.7	1246.1
1246.3	1246.5	1246.7	1246.8	1246.8	1246.8	1246.8	1246.8	1246.7	1246.7
1246.6	1246.6	1246.6	1246.7	1246.7	1246.9	1247.0	1247.1	1247.3	1247.5
1247.6	1247.8	1248.1	1248.4	1248.9	1249.5	1250.1	1250.8	1251.5	1252.3
1253.0	1253.7	1254.5	1255.3	1256.3	1257.7	1259.5	1261.7	1264.0	1266.0
1267.6	1268.7	1269.5	1270.1	1270.5	1270.6	1270.4	1270.0	1269.4	1268.8
1268.3	1267.8	1267.4	1267.0	1266.7	1266.4	1266.0	1265.6	1265.2	1264.8
1264.5	1264.2	1263.9	1263.7	1263.5	1263.3	1263.2	1263.1	1262.9	1262.8
1262.6	1262.5	1262.3	1262.1	1261.9	1261.8	1261.6	1261.4	1261.2	1261.0

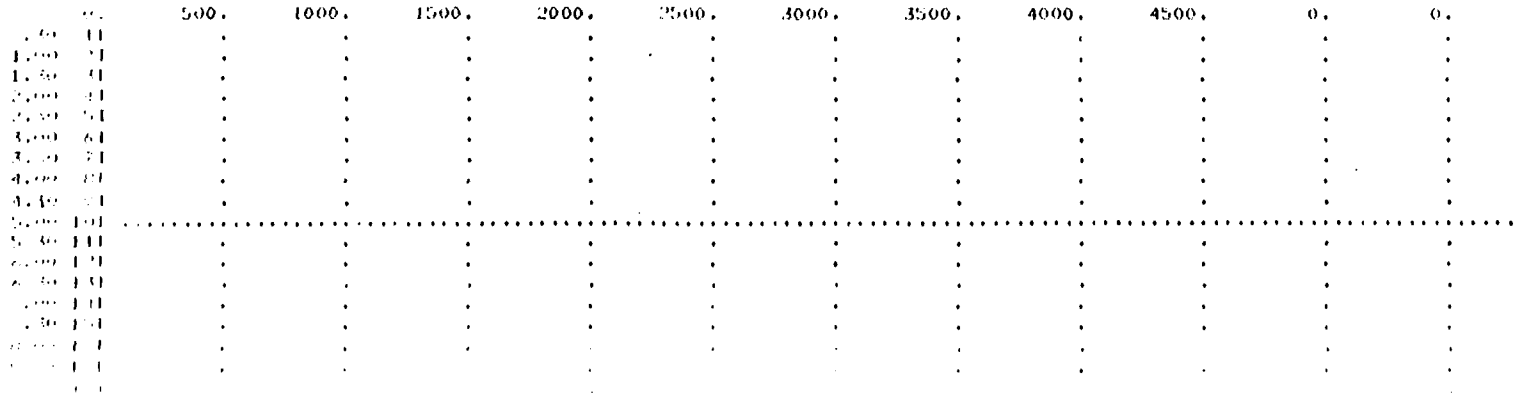
PEAK OUTFLOW IS 3954. AT TIME 43.00 HOURS

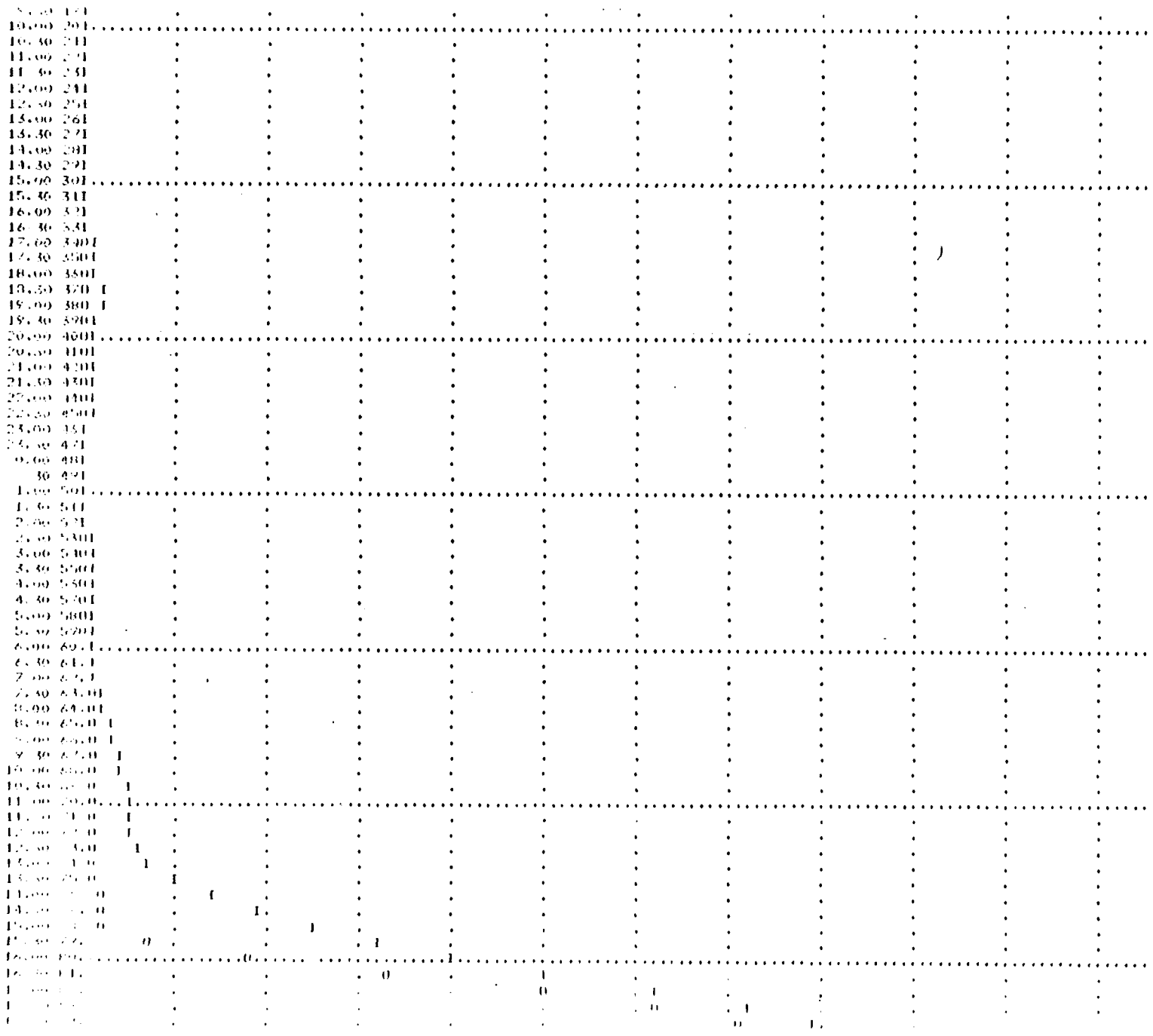
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3954.	2960.	1007.	412.	49473.
CMS	112.	84.	29.	12.	1401.
INCHES		17.21	23.42	23.97	23.97
MM		437.06	594.97	608.83	608.83
AC-FT		1468.	1998.	2044.	2044.
THOUS CU M		1810.	2464.	2522.	2522.

1HPLT

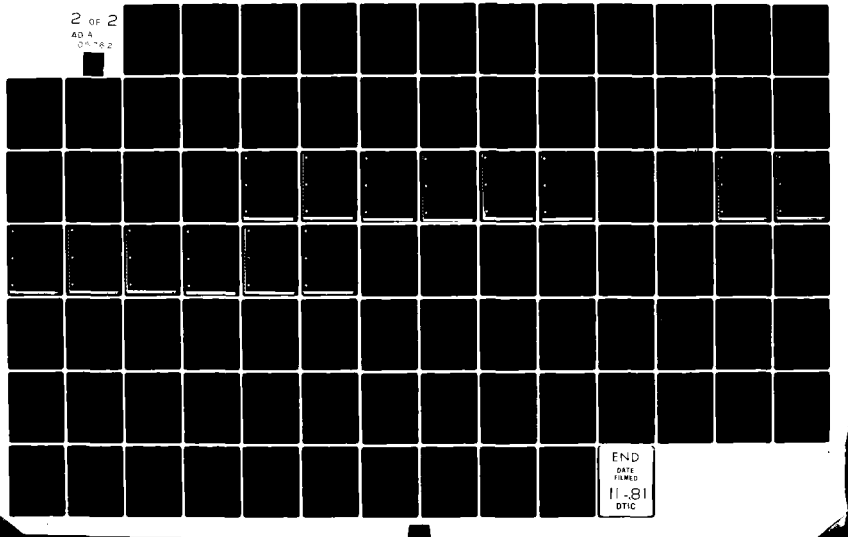
STATION 1

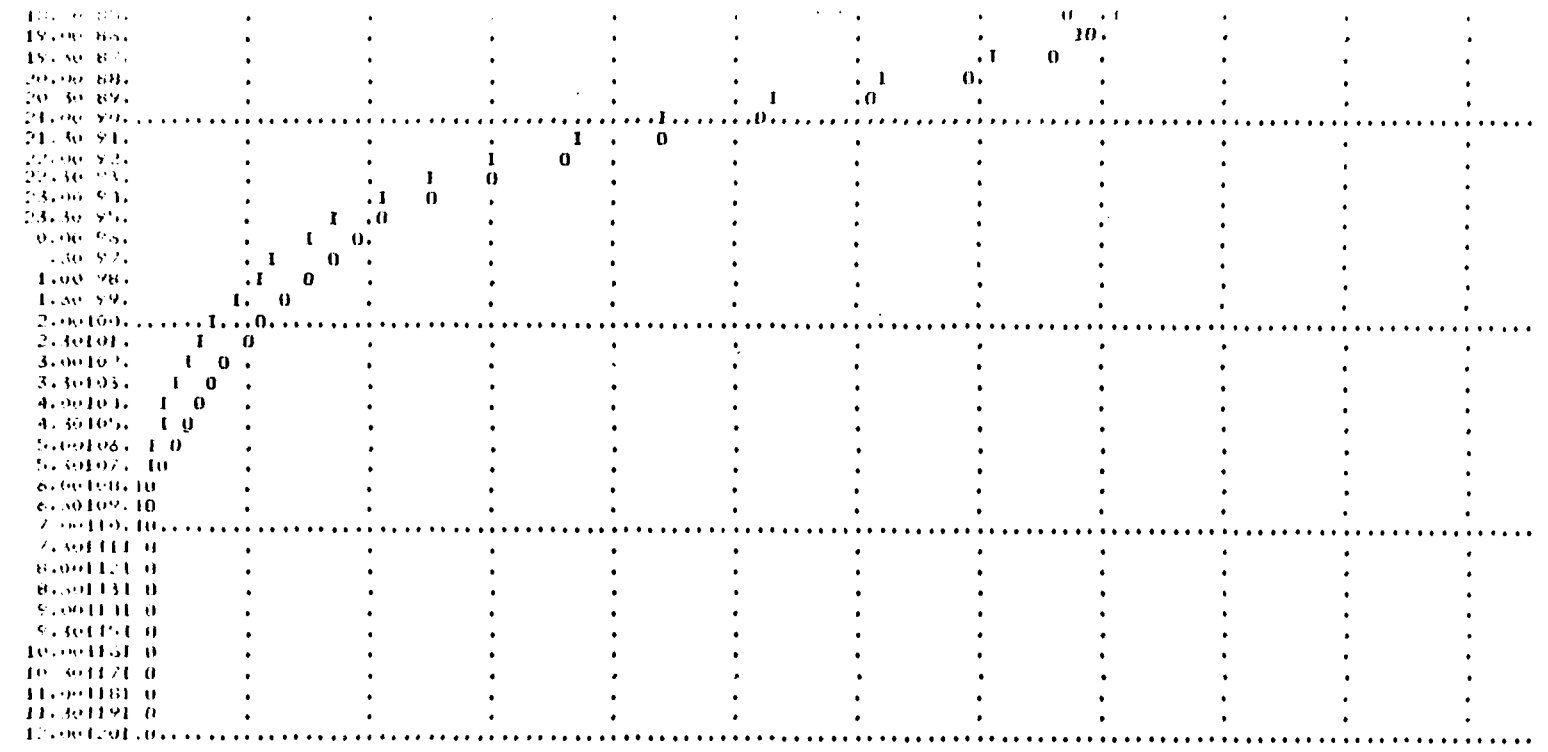
INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)





AD-A105 762 FLAHERTY-GIAVARA ASSOCIATES NEW HAVEN CT F/G 13/13
NATIONAL DAM SAFETY PROGRAM. LITTLE CHOCONUT WATERSHED SITE 28 --ETC(U)
JUN 81 H C FLAHERTY DACW51-81-C-0006
UNCLASSIFIED NL





(HOUR)

********** ********** ********** ********** **********

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 .10	RATIO 2 .20	RATIO 3 .30	RATIO 4 .40	RATIO 5 .50	RATIO 6 .60	RATIO 7 .70	RATIO 8 .80	RATIO 9 1.00
HYDROGRAPH AT	1	1.60	1	407.	815.	1222.	1630.	2037.	2445.	2852.	3260.	4075.
	(	4.14)	(	11.54)(	23.08)(	34.62)(	46.16)(	57.70)(	69.23)(	80.77)(	92.31)(	115.39)
ROUTED TO	1	1.60	1	83.	434.	910.	1464.	1947.	2368.	2770.	3166.	3954.
	(	4.14)	(	2.35)(	12.29)(	25.76)(	41.46)(	55.13)(	67.04)(	78.43)(	89.65)(	111.99)

SUMMARY OF MULTIPLE ANALYSIS

		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	ELEVATION	1243.68	1263.00	1274.30
	STORAGE	5.	240.	558.
	OUTFLOW	6.	106.	6730.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1258.53	0.00	154.	83.	0.00	47.50	0.00
.20	1264.28	0.00	269.	434.	0.00	45.00	0.00
.30	1266.14	0.00	314.	910.	0.00	44.00	0.00
.40	1267.31	0.00	344.	1464.	0.00	43.50	0.00
.50	1267.95	0.00	361.	1947.	0.00	43.00	0.00
.60	1268.51	0.00	377.	2368.	0.00	43.00	0.00
.70	1269.04	0.00	392.	2770.	0.00	43.00	0.00
.80	1269.57	0.00	407.	3166.	0.00	43.00	0.00
1.00	1270.62	0.00	438.	3954.	0.00	43.00	0.00

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

APPENDIX D

PREVIOUS INSPECTION REPORTS/AVAILABLE DOCUMENTS

DESIGN REPORT

LITTLE CHOCONUT, FINCH HOLLOW,
AND
TROUT BROOK WATERSHED PROECTION PROJECT

DESIGN REPORT

SITE 2B

BROOME COUNTY, NEW YORK

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

U S DEPARTMENT OF AGRICULTURE — SOIL CONSERVATION SERVICE

This floodwater retarding structure is located on Little Choconut Creek approximately 4.5 miles north of Johnson City, New York. Sheet 4 of this report, together with the Castle Creek, N.Y. 7.5' quadrangle published by the U. S. Geological Survey, may be used to locate this structure.

A summary of pertinent design information is given on Sheet 2 of this report.

Criteria and procedures used in this design are given in Soil Conservation Service publications.

This is one of eight proposed floodwater retarding dams in the Little Choconut, Finch Hollow, and Trout Brook Watershed designed to reduce floodwater damages. It will retard a 100-year frequency storm without discharge occurring in the emergency spillway.

The results of hydrologic and hydraulic computations are given on Sheet 3 of this report.

The structure consists of a compacted earth fill with a cutoff trench through the Sp-Sm material in the flood plain and into the glacial till in both the flood plain and left abutment and into firm bedrock in the right abutment. A drainage system is located under the downstream portion of the earth fill to control the phreatic surface and provide a safe outlet for foundation seepage.

The principal spillway is a drop inlet structure consisting of a single stage reinforced concrete riser, a 30 inch diameter reinforced concrete water pipe, and a reinforced concrete impact basin to dissipate the energy of high velocity discharge at the outlet end of the conduit.

The emergency spillway is an earth and rock cut in the right abutment. An engineering cost analysis was performed which resulted in the least combined cost of fill and emergency spillway rock excavation.

U S DEPARTMENT OF AGRICULTURE — SOIL CONSERVATION SERVICE

DESIGN REPORT SUMMARY

I. Watershed data

A.	Structure class	C
B.	Drainage area	1024 Ac
C.	Time of concentration - T_c	1.30 Hrs
D.	Hydrologic curve number - C_n	
	Moisture Condition II	74

II. Principal spillway

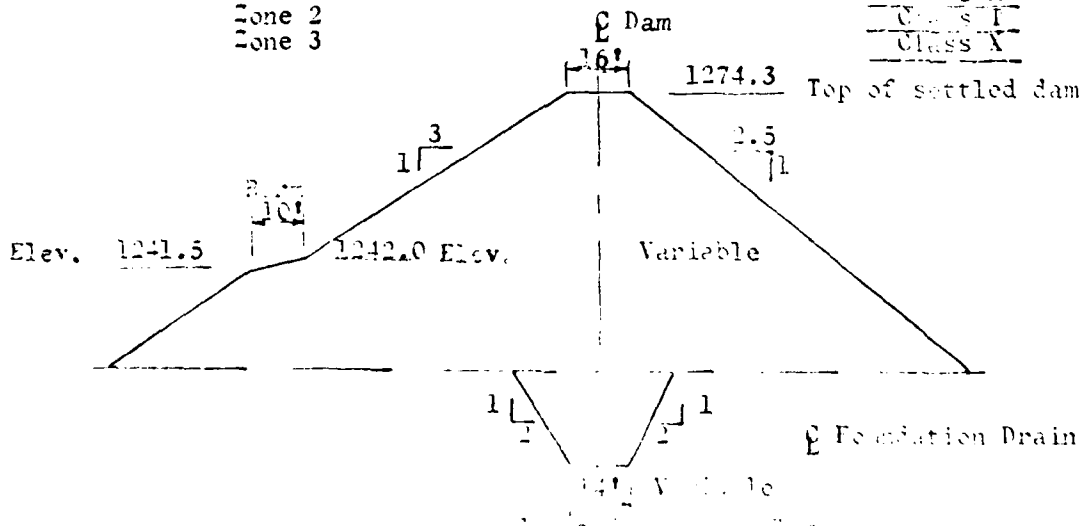
A.	Conduit	
	1. Size (I.D.)	30 In.
	2. Length	1[illegible]6 Ft.
B.	Riser	
	1. Size	2.5 x 7.5 Ft.
	2. Height (floor to crest)	10 Ft.
C.	Weir length (13 ft. used for design)	13.33 Ft.
D.	Reservoir drain size	12 In.
E.	Type of energy dissipator	concrete impact basin

III. Emergency spillway

A.	Width	55 Ft.
B.	Side slopes	(outside slope 1:1 & 2:1)(inside slope 3:1)
C.	Length of level section	50 Ft.
D.	Exit slope	0.025 Ft./Ft.
E.	Maximum velocity - to exit section (VES)	2.98 Ft./Sec.
F.	Duration of flow (ESH) through emergency spillway	7.94 Hrs.
G.	Frequency of use	100 yrs.

IV. Fill (Dam & Dike)

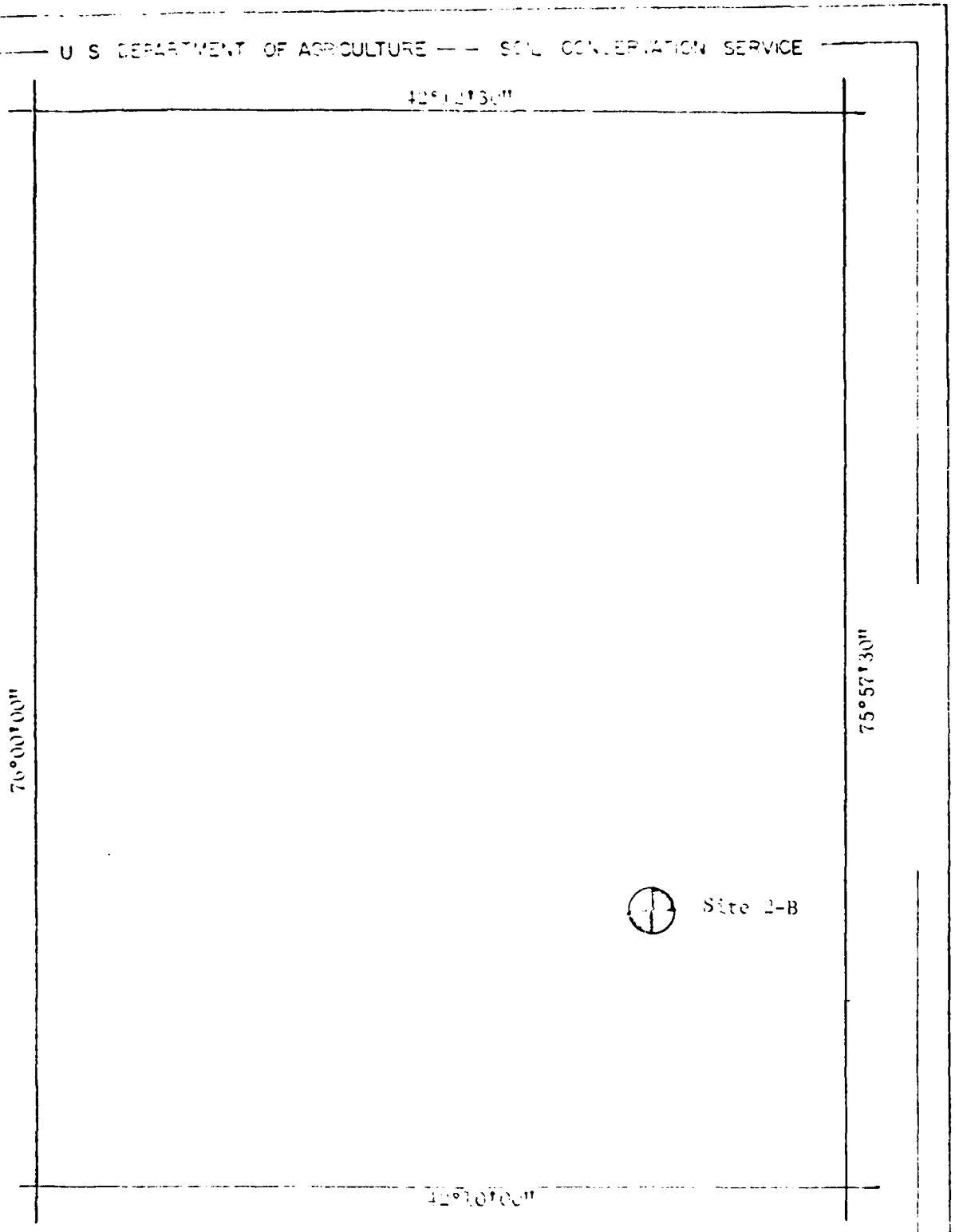
A.	Height	45 Ft.
B.	Volume	
	Zone 1	95,100 C.Y.
	Zone 2 & 3	5,700 C.Y.
C.	Compaction	
	Zone 1	Class A
	Zone 2	Class I
	Zone 3	Class X



U.S. DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

Element of Structure	Determining Factor	Elevation	Surface Area Acres	Storage		Inflow		Peak Outflow c.f.s.
				Acre-Feet	Inches *	Volume Inches *	Rate c.f.s.	
Crest of Riser	50 year submerged sediment accum.	1242.5	4.0	13.8 1/	0.16			
Crest of emergency spillway	Structure proportioning	1263.0 3/	21.8	212 2/	2.48			106
Design high water	1.00 x value from ** ES 1020 Sh. 4 of 5, Moisture Condition II	1266.8	26.0	305 2/	3.57	6.11	2608	1080
Top of Dam	1.00 x value from ** ES 1020 Sh. 5 of 5, Moisture Condition II	1274.3	34.8	533 2/	6.25	20.15	8512	6730

* Runoff expressed in inches of runoff from controlled area of 1,024 acres.
** Hydrologic criteria in National Engineering Memorandum SCS-27 (Rev.).
1/ Time required to empty temporary storage = 1.7 days.
2/ Storage allocated to sediment pool.
Does not include 58.1 ac.ft. of sediment.
3/ Minimum emergency spillway crest for 100-year frequency storm is 1260.8.



Reference: USGS 7.5 Quad. 1:24,000

CASTLE CREEK, NEW YORK

U S DEPARTMENT OF AGRICULTURE — SOIL CONSERVATION SERVICE

Information pertaining to the criteria and procedures referred to in this report may be obtained from Mr. Wallace L. Anderson, State Conservationist, USDA, Soil Conservation Service, Syracuse, New York.

Lester L. Lance

SLOPE STABILITY ANALYSIS

U.S. DEPARTMENT of AGRICULTURE
SOIL CONSERVATION SERVICE

MATERIALS TESTING REPORT
SUMMARY - SLOPE STABILITY ANALYSIS

PROJECT and STATE

METHOD OF ANALYSIS

ANALYZED BY

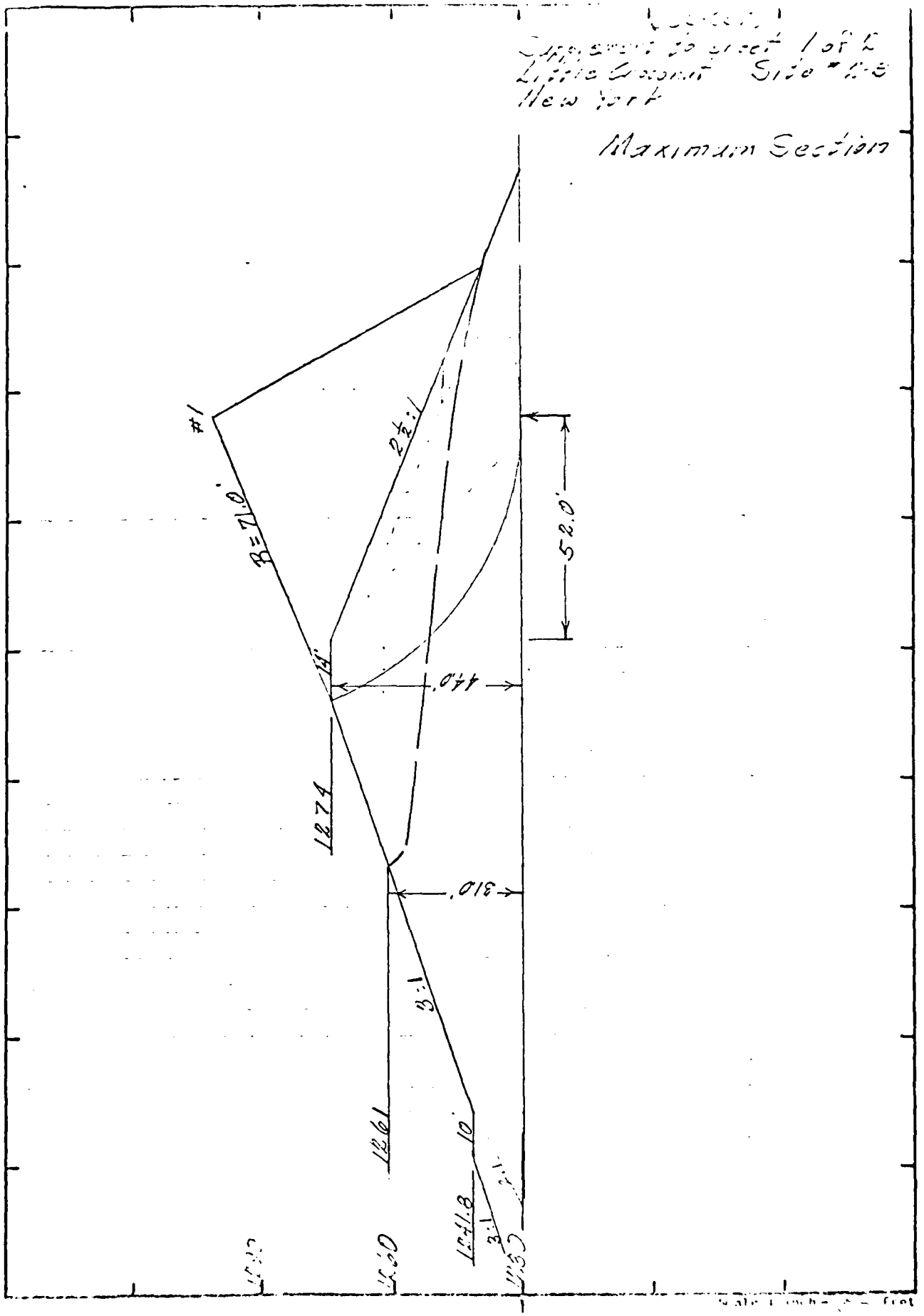
APPROVED BY

DATE

SOURCE AND USE OF MATERIALS	CLASSIFICATION	ADOPTED DESIGN DATA γd (pcf)	γm (pcf)	γsat (pcf)	γsub (pcf)	φ (deg)	tan φ	c (psf)
(1) Borrow Emb	CL	111.1	118.5	132.2		18°	0.325	975
(2) Borrow Emb	GM	129.0	139.5	146.0		24°	0.445	1050
(3)								
(4)								
(5)								
(6)								
(7)								
(8)								

REMARKS

TRIAL NO.	SLOPE	CONDITIONS	F_s
		MAXIMUM SECTION	
		DOWNSTREAM	
1	Rapid	No drain - No berm - Arc cut from approximate line of material #1 only.	2.2


Maximum Section
#1
B=71.0'
2½:1
52.0'
44.0'
1874
31.0'
3:1
1861
10'
1848
3:1
1830

GEOLOGY REPORT

GEOLOGY REPORT

SITE 2-B

LITTLE CHOCONUT WATERSHED

MAINE TOWNSHIP

NEW YORK

APPROVAL:

W. S. Atkinson
State Conservation Engineer

PREPARED BY:

B. S. Ellis
Bernard S. Ellis
Geologist

REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	SCS NO NY-2017-G 1 of 21 12/65

DETAILED GEOLOGICAL INVESTIGATION OF DAM SITES

GENERAL

New York	Broome		Little Choconut Cr
	WP-08	2-B	C
B Sills	Geologist	Backhoe, Drill Rig	10/65

SITE DATA

1.6	1,024	Earth Fill	Floodwater Retarding
	Southeast	45.0	800
	85,000		

STORAGE ALLOCATION

13.5	2.5	12.5
170	19.5	31.0

SURFACE GEOLOGY AND PHYSIOGRAPHY

Appalachian Plateau		Steep	Horiz.
8	30		175

This site is located approximately 5 miles due north of the city of Johnson City, New York. The Susquehanna River flows westerly along the southern edge of Johnson City at this point and is about 7 miles north of the New York-Pa. state line.

The topography of the area ranges from 810' in the Susquehanna River to 1500' plus in the vicinity of this site. The total relief is less today than it was pre-glacially, owing to aggradation of till on the uplands and valley sides and deposition of outwash and alluvial materials in river channels. This site is a good example of outwash and alluvial materials filling a pre-glacial valley.

Glacial ice had little effect on the topography in this area. The ice sheet was relatively thin, extending only some 40 miles south of the Binghamton area.

The underlying bedrock is Upper Devonian in age and is almost exclusively shales and siltstones of the Catskill Delta.

The geologic history of this site appears to be one of glacial scour of the north-facing valley wall (right abutment) and filling of the pre-glacial valley with lacustrine and alluvial deposits. Apparently, there has been some corrasion of the

bedrock in the lower elevation of the right abutment. Drill holes and test pits reveal the development of a shelf in the bedrock surface at about present stream bed elevation. This situation is further verified by the enhanced steepness of the abutment for a vertical distance of 30' or so above this shelf. This condition has been noted on other sites in this area and verified by drilling.

13-5 DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

Centerline of Dam

DRILLING PROGRAM

Type of Test	Number of Holes: Required	Number of Holes: Actual	Average Depth Range: Soil Type	Average Depth Range: Rock	Disposition
Backhoe	6	--	--	--	--
Drill Rig	4	4	20' of NX core	--	47 (Jar)
	10	4	20' of NX core	--	47 (Jar)

SUMMARY OF FINDINGS

The left abutment of this site is a fairly uniform glacial till. This uniformity extends down to the area of the principal spillway, and to a depth of at least 30' at DH 51.

In the floodplain, the till is replaced by a moderately dirty gravel to an average depth of 3'. This gravel is underlain by a 3'-5' layer of stiff clay. Under the clay, a moderately thick zone of coarse sand extends to below backhoe depth. DH 52 went through this sand and back into till, with bedrock being encountered at a depth of approximately 33'.

The sand is carrying a lot of water. Seepage is heavy in backhoe pits excavated in this material.

On the right side of the floodplain, the backhoe trench revealed the bedrock surface rising steeply from its location at DH 52 to within 4' or so of the surface. It forms a definite bench at this level and then follows parallel with the ground surface to a point beyond the emergency spillway excavation. The average depth to bedrock over this entire abutment is about 3'.

The bedrock encountered in this investigation is predominantly a siltstone with zones of softer shale. Several thin beds of very fine grained sandstone are mapped in the type section of this Rhinestreet Formation and were also logged in some of the drill holes on this site. Whereas, the overall picture of bedrock in this section of the state indicates a very gentle dip to the SW, in this immediate vicinity the strata dip S 60 W at a rate of about 90' to the mile.

A well developed set of north-south oriented joints exists in the bedrock in this area. This pattern is intersected by a less well developed east-west trending set.

DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

FEATURE Principal Spillway
(Centerline of Dam, Principal Spillway, Emergency Spillway, the Stream Channel, Investigations for Drainage of Structure, Borrow Area, Reservoir Basin, etc.)

DRILLING PROGRAM

Equipment Used	Number of Holes		Number of Samples Taken		
	Exploration	Sampling	Undisturbed (state type)	Disturbed Large	Disturbed Small
Drill Rig	2	2	--	-	26 (Jar)
Backhoe	5	1	--	2	-
Total	7	3	--	2	26 (Jar)

SUMMARY OF FINDINGS

(Include only factual data)

The two 20' drill holes located in the area of the riser and outlet structure were logged as 11'-13' of very dense till, underlain by 1'-2' of very silty gravel or clay. Below this, dense till was again encountered to a depth of 20'. The backhoe pit at the intersection of the C/L of dam and the principal spillway was also logged as 8' of dense till with one large 3'-4' boulder in the pit.

(5)

10-59

DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

FEATURE Emergency Spillway

(Centerline of Dam, Principal Spillway, Emergency Spillway, the Stream Channel, Investigations for Drainage of Structure, Borrow Area, Reservoir Basin, e

DRILLING PROGRAM

Equipment Used	Number of Holes		Number of Samples Taken		
	Exploration	Sampling	Undisturbed (state type)	Disturbed Large	Disturbed Small
Backhoe	7	2	--	2	--
Drill Rig	3	3	68' NX core	--	10 (Jar)
Total	10	5	68' NX core	2	10 (Jar)

SUMMARY OF FINDINGS

(include only factual data.)

The entire spillway area is in the bedrock more fully described under "Centerline of Dam." This rock is overlain by an average depth of 3.5' of silty gravel; a glacial till.

10-59

DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

FEATURE Borrow Area

Centerline of Dam, Principal Spillway, Emergency Spillway, the Stream Channel, Investigations for Drainage of Structure, Borrow Area, Reservoir Basin, e:

DRILLING PROGRAM

Equipment Used	Number of Holes		Number of Samples Taken		
	Exploration	Sampling	Undisturbed (state type)	Disturbed Large	Disturbed Small
Backhoe	6	2	--	2	--
Total	6	2	--	2	--

SUMMARY OF FINDINGS

(include only factual data)

The supplemental borrow area is located approximately 500' upstream from the C/L of the dam, on the left abutment. There are 8 acres of suitable borrow in this area, with a useable depth of 9'+. This will provide approximately 115,000 cubic yards of fill.

The material grades imperceptibly from a GM (silty gravel) to a CL (clay) with a high percentage of coarse material. Occasional large (2'-3') boulders were encountered in the test pits in this area.

7

10-59

DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

FEATURE Miscellaneous

(Centerline of Dam, Principal Spillway, Emergency Spillway, the Stream Channel, Investigations for Drainage of Structure, Borrow Area, Reservoir Basin, etc.)

DRILLING PROGRAM

Equipment Used	Number of Holes		Number of Samples Taken		
	Exploration	Sampling	Undisturbed (state type)	Disturbed Large	Disturbed Small
Total					

SUMMARY OF FINDINGS

(include only factual data)

Drain Line

Three backhoe pits were dug in the vicinity of the drain line. Representative samples of the material were taken and processed for filter design.

Water Supply

This stream has a good base flow. During the investigation, the driller was able to pump steadily from a sump in the channel bottom at a steady rate of 50 g.p.m.

Other Materials

The bedrock in the emergency spillway excavation will not make durable riprap. It is, however, possible that it may be suitably incorporated in the fill.

Natural drainage materials are absent on this site or occur in locations that do not make them readily available.

(8)

SOILS CORRELATION TABLE
AND
ESTIMATED AVAILABLE BORROW QUANTITIES

Watershed: L. Choconut Creek Site No. 2-B State: N.Y. Prepared by: B.S.Ellis Date: 12/65

Sample

103.1
104.1 These samples were taken to provide data on the range of materials available in the borrow area. They represent symbol D. There are in excess of 100,000 cubic yards of this material available.

202.1
209.1* These samples represent the overburden material in the emergency spillway excavation.Symbol E. There are 2,000 cubic yards of this material available.

302.1* This sample is representative of the material logged as a grayish brown clay in the floodplain. Symbol B.

302.2* This sample represents the gravelly sand aquifer logged in the floodplain. Symbol C.

* Processed in SCS State lab, Syracuse, New York.

(9)

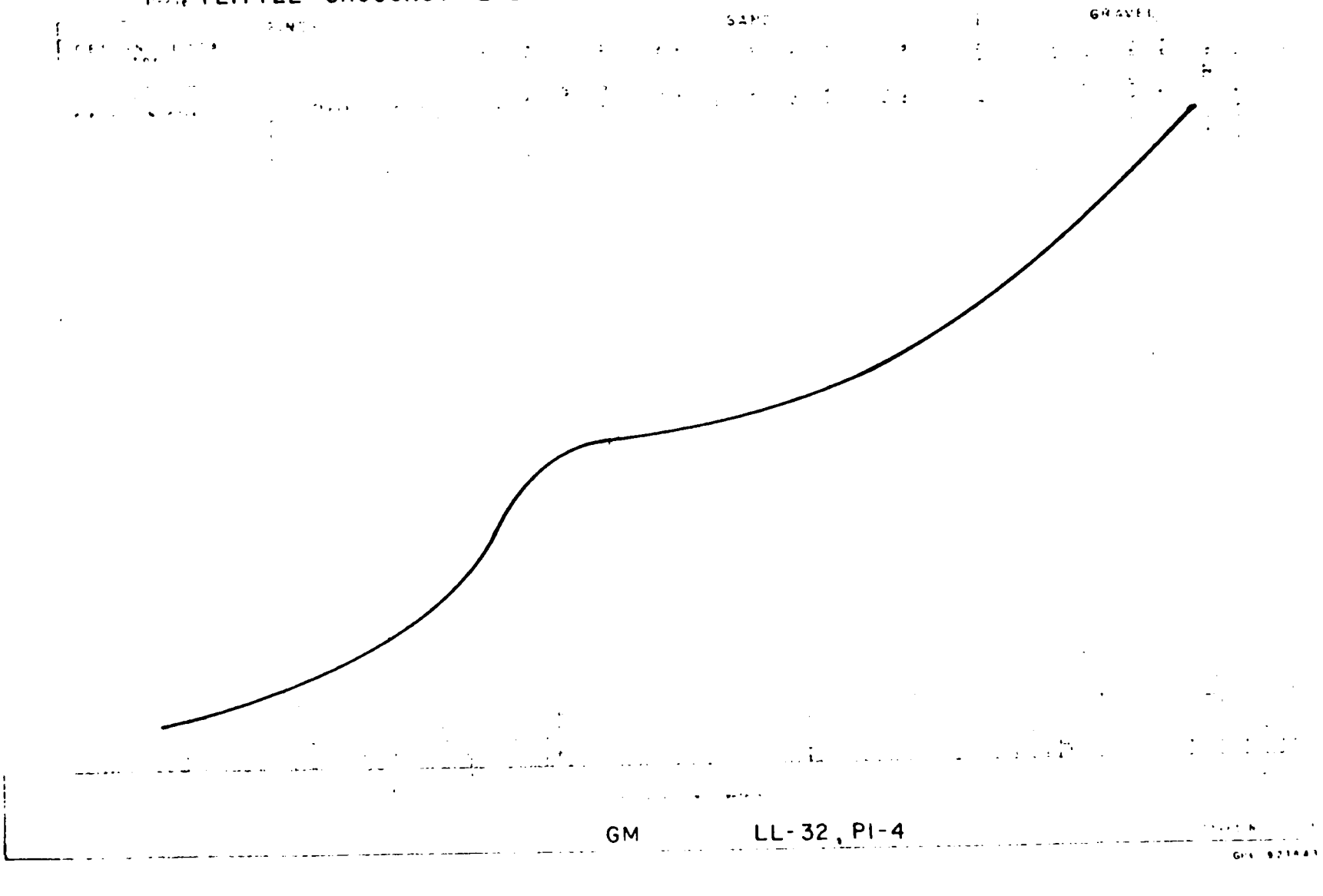
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GRAIN SIZE DISTRIBUTION GRAPH

SAMPLE 209.1

LITTLE CHOCONUT 2-B

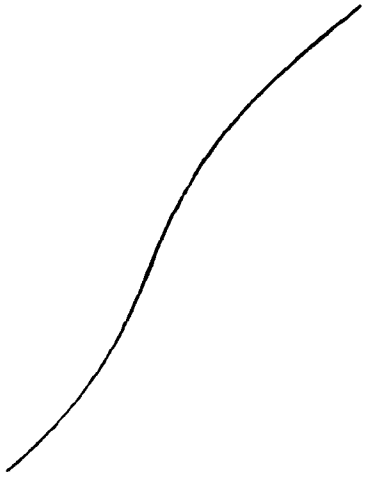
Location BROOME CO., N.Y.



SAMPLE 302 I

LITTLE CHOCONUT 2-B

BROOME CO., N.Y.

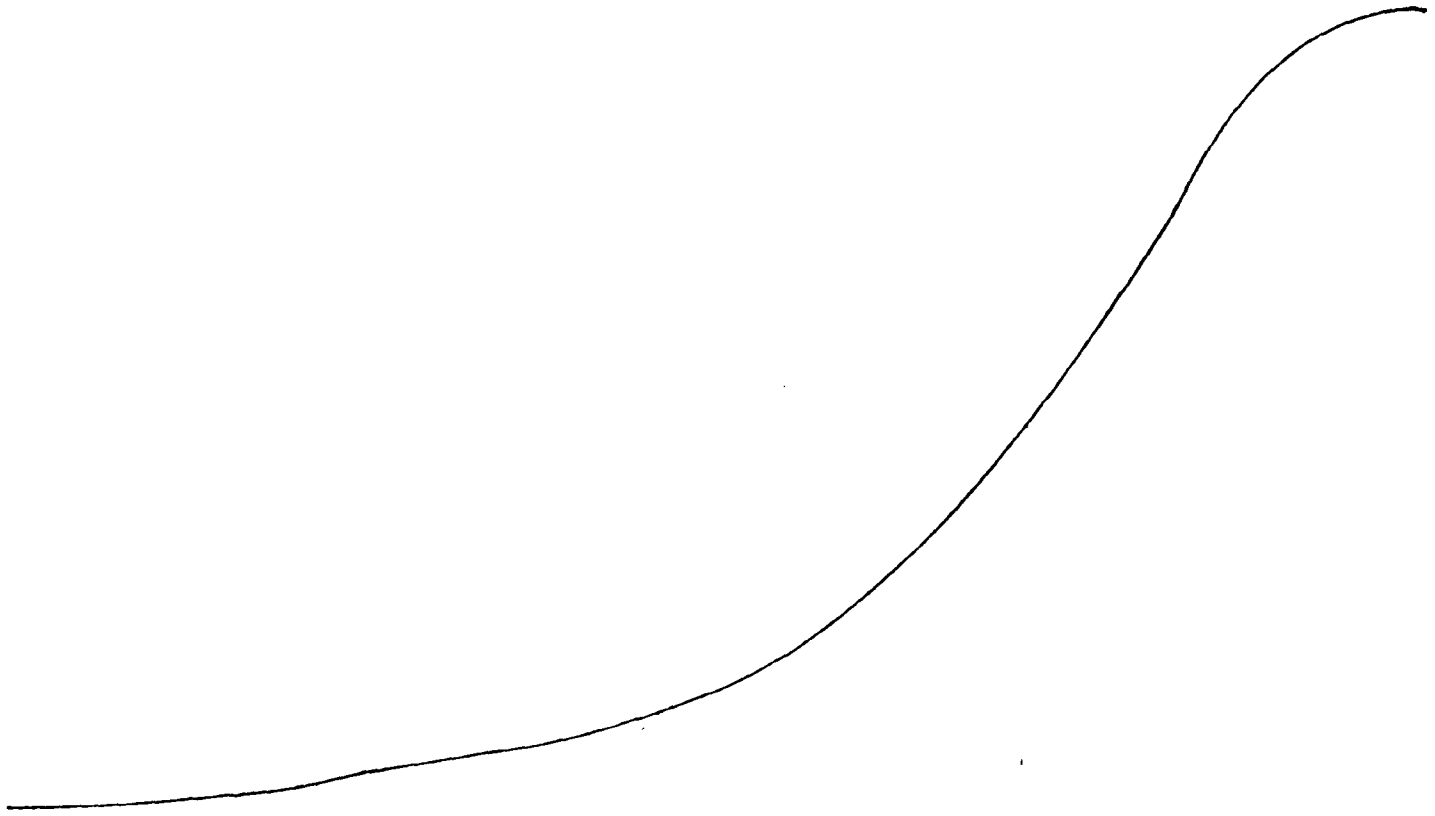


CL LL-36, PI-12

LITTLE CHOCONUT 2-B

SAMPLE 302 2

BROOME CO., N.Y.



SP - SM

New York , Broome , L. Choconut ,

, 2B , C , , Geologist , 10/65

INTERPRETATIONS AND CONCLUSIONS

Centerline of Dam

The left abutment of this site, from the top of dam down to about the principal spillway location, is a fairly uniform glacial till.

There was little or no seepage observed in any of the test pits in this area. The till is quite dense, with moderately high blow count logged to a depth of 30 feet in D.H. 51.

In the flood plain, we have about 3 feet of dirty gravel, underlain by approx. 4 feet of stiff clay. In the backhoe pits, a coarse sand under the clay is carrying a lot of water and caves quite readily. The stiff clay and the upper portion of the sand runs a little below 20 blows/ft., but I don't feel it is significant with respect to consolidation for this fill height.

D.H. 52 encountered bedrock at 33 feet. This rock surface rises steeply under the stream and forms a shelf between the stream and the base of the right abutment. From this point and on up the right abutment, the bedrock surface is a fairly uniform 3-4' below ground surface. Differential settlement will undoubtedly occur in the zone adjacent to the bedrock surface between the shelf and the stream. We do have some plastic material available for borrow and conceivably could selectively place this material in this location.

Pit 1 was dug as a trench from the base of the abutment out toward the stream. We were able to cut through 2 feet or so of the bedrock before encountering "solid" rock. I assume that this same condition exists in the elevation zone between the flood plain and the emergency spillway.

The base of the coarse sand is shown at a depth of 14 feet in D.H. 52. This is an indicated guess. The groundwater table, while not well defined, is either at the top of this sand or in the overlying clay. Seepage water in the surface gravel is undoubtedly influent from the stream and partially perched above the main table. The same old problem of trying to correlate spoon samples with backhoe pit logs in some materials was present here. In this case, I believe the 2" spoon driven into this material had a tendency to consolidate it and incorporate some of the fines from wash and seepage water. We were just unable to get the same material out of these spoon samples. Therefore, I am not just sure where it does end.

In any event, the 14 foot depth is probably conservative. The problem of consideration of cutoff depth is tied in with this. It is my feeling that a cutoff through this material is not feasible. Excavation will be difficult at best and we could wind up with a top width of the cutoff trench approaching the base width of the dam! (This is of course an exaggeration, but it could be a big one.) I would like to suggest then that consideration be given to allowing water to pass through this sand and be picked up downstream with a good sized drain. If this is done, then we could get by with a shallow cutoff in the left abutment; through material A in the flood plain and down to "solid" rock in the right abutment and on the rock shelf in the flood plain. It should

State New York County Broome Name L. Choconut

Site number 28 Class C Structure class , Geologist 10/65

INTERPRETATIONS AND CONCLUSIONS (continued)

be pointed out that it may be difficult to cut this trench to a uniform "neat" line. The excavation characteristics of this interbedded siltstone and shale with occasional fine-grained sandstone is such that we may wind up with a series of benches in the profile.

The design of the drainage material should be based on samples #302.1 and 302.2. It should probably be extended down into the sand a couple of feet to provide a little more intake area as well as removal of any contamination from fines in the overlying CL material. I do not have any information on the specific permeability of these sands, except that it is high. The size of the drainage system should definitely be large enough to carry the extra seepage induced by raising headwater behind the structure.

There is some indication of minor seepage in the bedrock in the right abutment, but no well defined seep areas were noted during this investigation.

Principal Spillway

Several locations were investigated for the principal spillway. These locations are defined by the test pits on the plan view.

It appears that the best location will be the one shown on the plan view of the structure, located approx. 10 feet left of the line through B.H. 351 and 352. This arrangement should keep the pipe etc. off the softer clay underlying the major portion of the floodplain.

The material under the extent of the pipe is a dense till, uniform in strength and depth. Some excavation will have to be done at the riser and outlet structure location but this should not be a big cost item.

Emergency Spillway

The emergency spillway excavation will, of course, be in rock. The State Conservation Engineer has studied the rock cores and recommendations for design will not constitute a part of this geology report.

Suitability of the rock excavated from the spillway, for incorporation in the fill, will be determined from the results of tests performed on cores submitted to the Lincoln Lab. Photographs of the weathering characteristics of the rock are a part of this report. Test shows cuts that are approx. 25 years old and represent the range of rock that we may expect in the spillway excavation.

Soil Conservation Service

10-69

DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

State New York County Broome Watershed L. Choconut

Site number 2B Site group C Structure class Investigated by , Geologist 10/65

INTERPRETATIONS AND CONCLUSIONS (continued)

Borrow

There will be approximately 2,000 cu. yds. of overburden material available from the emergency spillway excavation. This is represented by samples #202.1 and 209.1.

A separate borrow investigation was made for this structure. Two representative samples of the material were obtained (103.1 and 104.1). They indicate the range in this material, from a GM to a CL. This variation apparently occurs as a gradational change, rather than an abrupt one. The materials cannot, therefore, be segregated in the field with any degree of certainty. We can probably effect informal zoning by some selective placement, but I feel the embankment should be tested and designed for the lower strength of these two borrow samples and as a homogeneous fill.

SOILS ANALYSES

UNITED STATES GOVERNMENT

Memorandum

TO : W. S. Atkinson, State Conservation Engineer, SCS, Syracuse, New York 13210

DATE: March 8, 1966

FROM : Rey S. Decker, Head, Soil Mechanics Laboratory, SCS, Lincoln, Nebraska 68508

SUBJECT: ENG 22-5, New York WP-08, Little Choconut, Site No. 2-B (Broome County)

ATTACHMENTS

1. Form SCS-354, Soil Mechanics Laboratory Data, 1 sheet.
2. Form SCS-355A, Triaxial Shear Test Data, 3 sheets.
3. Form SCS-352, Compaction and Penetration Resistance, 2 sheets.
4. Form SCS-357, Summary - Slope Stability Analysis, 2 sheets.
5. Form SCS-372, Recommended Use of Excavated Material, 1 sheet.
6. Investigational Plans and Profiles

REVIEW AND INTERPRETATION OF DATA

FOUNDATION MATERIALS

A. Bedrock: Bedrock consists of siltstone and shale. It is close to surface (3' to 4') in the right abutment. It drops off to 33' in Test Hole No. 52 and was not drilled to the left of that station (stationing not shown). The rock is jointed and relatively thin bedded.

B. Soil Classification: No centerline samples of floodplain materials were submitted. Both the clayey material, zone 'B', and the sand below it, zone 'C', are represented by grain size distribution graphs and Atterberg tests furnished with the geologic report. The clay classes as a CL and the sand as SM-SP. The description states the floodplain is "dirty gravel" to about a 3' depth which is underlain by "3' to 5' of stiff clay". This is a very fine lacustrine material as shown by the gradation from the laboratory at Syracuse.

Under the lacustrine clay, is a zone of coarse sand of variable thickness ranging from 5' to 7' which was classed as SP-SM from a gradation made in Syracuse. In Drill Hole No. 52 this material contained more plastic fines.

The left abutment is all a fairly uniform, dense till which is represented by Sample 66W1920 (103.1), a low-plastic GM. This till

appears to extend under the left side of the floodplain as the rock contact continues to drop.

Water table was not recorded, but seepage was noted in the SP-SM, zone 'C', and up into zone 'B'.

C. Dry Unit Weight (Blow Count): No density tests were made, but blow count is quite high. This would indicate high strength if all materials were saturated. Since the CL in zone 'B' appears to be saturated, it is probably dense and strong. In-place density tests should be made, if there is any doubt. The material should be tested, if the density is not high, instead of taking chances on a dam with high damage classification.

D. Consolidation: Based on blow count and classification, an estimate of 0.03 ft./ft. is made as an average for 12' of foundation. Use 0.04' as a conservative maximum.

Consolidation under the conduit at its proposed location will be practically negligible. The differential consolidation near the right abutment is not expected to be great enough to cause tension cracks in the moderately plastic center section material.

E. Permeability: The till and the CL shown as zone 'B' are described as very low in permeability. The surface GM is probably moderately permeable and the SP-SM is described as very permeable. Based on its gradation alone, a rate of k = 100+ ft./day might be expected, but its high density indicates half that rate might be more applicable.

Permeability of the rock was not discussed. The well formed joint pattern would indicate some seepage, but probably not great below the severe surface weathering.

F. Shear Strength: Based on the blow count and classification, it appears that any embankment failure would be limited to the base of zone 'B' or to the embankment only. We have very little basis for assessing the strength of the CL (zone 'B'), if that zone was not saturated when the blow count was taken.

EMBANKMENT MATERIALS

A. Classification: Embankment samples submitted consisted of a low plastic GM, a fairly plastic CL sample, and a GC-GM sample. There is very little material represented by the GC-GM. The GM and the CL, together, account for 100,000 cu. yds. No estimate was made as to how much of

each is available. It appears they can be separated but only on a selective basis, as borrowing proceeds.

No estimate was made on the quantity of rock available. If the spillway is placed as shown on cross sections, about 13,000 cu. yds. would seem to be available. It would appear that about 4,000 cu. yds. may be quite durable as rock fill.

B. Compacted Dry Density: Standard Proctor compaction tests (ASTM D-698) on the minus No. 4 size fraction yielded maximum dry densities of 119.5 pcf for the GM and 117.5 pcf for the CL. The GC-GM was not tested.

It is estimated that the hard portion of the spillway rock excavation may provide a relatively clean rock fill that would be placed at about 115 pcf. The softer materials should compact to an acceptable degree under an equipment use specification. If a method specification is not acceptable, it will be necessary to test large size samples at field moisture conditions or build and test some test fills to determine mass density specifications.

C. Permeability: The till material in the center section should be nearly impermeable at 95% of standard density.

The softer shale fill should be only slightly permeable, but the harder rock material would form a relatively permeable fill, if it can be separated.

D. Shear Strength: Consolidated, undrained, triaxial shear tests were made on the minus No. 4 screen gradation of the GM till Sample 66W1920 and on the CL till Sample 66W1921. The specimens were molded at 95% of standard density and tested at near saturation. The degree of saturation varied for Sample 66W1920, and it is hard to interpret an actual total stress envelope, but the material is certainly strong. It could be any place from $\phi = 31°$, $c = 300$ psf to $\phi = 24°$, $c = 1050$ psf. The results on the CL are $\phi = 18°$, $c = 875$ psf at a high degree of saturation. This is considered as a limiting strength.

E. Consolidation: No tests were made. No more that 2% of the fill height should be anticipated for settlement within the fill itself due to residual consolidation.

SLOPE STABILITY ANALYSIS

Downstream slope stability was checked with one arc by a circular failure method. A safety factor of 2.2 was computed against steady seepage,

impinging on the slope at a height of about one-third the reservoir head.

The stability of a 3:1 slope against full drawdown would be as good, so no other trials were made.

SETTLEMENT STRAINS

Settlements within the foundation materials will be low and no problem of settlement strains is anticipated.

ROCK SOUNDNESS

Visually from inspection of rock cores and from pictures of exposed rock faces, it is evident that rock hardness and durability are quite variable.

Bulk dry density of specimens tested varied from 159 pcf to 164 pcf.

Absorption varies from 2% to 3%.

Percentage of loss under five cycles of sodium sulfate soundness test, Federal Specification-SS-R-406 (Method 203 - Ledge Rock), varied from 56.9% to 73.8%. The losses came from complete disintegration of many soft specimens, but very little loss from hard ones.

CONCLUSIONS AND RECOMMENDATIONS

A. Cutoff: A positive cutoff is attainable but is not believed to be necessary or economically advisable.

Cutoff is recommended through the gravelly surface in the floodplain to bottom at about a 4' to 5' depth in the lacustrian CL. On the abutments it should be about the same depth and bottom in relatively unweathered rock on the right abutment and in dense till on the left abutment.

Use care to prevent drying cracks and slaking in the exposed shale or fine lacustrine materials during construction.

Backfill with select plastic till material placed at 95% of standard or better with moisture controlled at or above optimum.

B. Principal Spillway: The proposed location provides for a good foundation condition.

The pipe cradle can be set on dense till or lacustrine material.

A stilling basin can be cut into the compact till and little seepage

is anticipated.

Foundation consolidation will be a minimum, and normal pipe joints and no camber are recommended in this case.

Use $\phi = 35°$ to represent the strength of moist fill in conduit loading computations.

C. Drainage: A drain is recommended to relieve uplift and prevent piping. A trench drain at c/b = 0.6 with a perforated pipe outlet is suggested.

It should bottom well into the sandy, gravelly, zone 'C' materials across the floodplain and into the weathered rock surface of the right abutment. In the till of the left abutment a 4' depth will suffice.

The drain should extend laterally up to elevation 1250 in both abutments and should completely encompass the conduit at their intersection.

Samples were not available to completely define the filter needed, but based on the SP-SM gradation of Field Sample 302.2 made at the Syracuse laboratory, a uniform filter gradation of No. 8 screen size to 1" would be desirable. This can be used with 3/8" pipe slots.

D. Embankment Design: The following are recommended:

1. Place the till selectively to use the most plastic as a center section.

   Use the shale and siltstone from the emergency spillway excavation in the downstream slope. (See Form SCS-372.) It should be protected from surface exposure by a blanket of till, except at the toe of the slope, where a selected section of the most durable rock may be placed as a drainage feature.

2. Place the till at 95% of Standard Proctor density, based on the minus No. 4 screen size material.

3. Provide a 3:1 upstream slope with berm and a 2 1/2:1 downstream slope as proposed.

4. Provide overfill of 1.0' across the floodplain section to compensate for residual settlement in the fill and foundation.

E. Emergency Spillway: The rock nature is such that soft materials will weather and slake with time.

6 -- W. S. Atkinson -- 3/8/66
Rey S. Decker
Subj: ENG 22-5, New York WP-08, Little Choconut, Site No. 2-B

Hard members are resistant and appear to be numerous enough so that danger of serious damage to the control section should not be great during any one storm event, even at 11 feet per second velocity.

This danger can be minimized by use of a wider control section and by judicious placement as the spillway excavation proceeds.

Prepared by:

R. B. Phillips

Roland B. Phillips

Attachments

cc: W. S. Atkinson
H. M. Kautz, Upper Darby, Pa.
Bernard S. Ellis, Syracuse, New York
W. L. Anderson, Syracuse, New York
R. J. McClimans, Binghamton, New York

Form SCS
Nov. 1952

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NEW YORK

LABORATORY SAMPLE NUMBER	FIELD NUMBER	LOCATION AND DESCRIPTION	DEPTH	FIELD CLASSIFICATION	MECHANICAL ANALYSIS GRAIN SIZE DISTRIBUTION EXPRESSED AS PERCENT FINER										
					FINES					SANDS					
					0.002 mm	0.005	0.02	0.05	#200 0.074	#140 0.105	#60 0.250	#40 0.42	#20 0.84	#10 2.0	#4 4.78
66W		Little Choconut Site No. 2-B													
1917	202.1	Emer. Spwy. L.Bag	2'	GM	5	11	26	[illegible]	31	32	[illegible]	13	36	[illegible]	3.5
		(203) and 204.1 = 2,000 cu. yds.)													
1918	251	Emer Spwy Excavation Rock Core													
	"	66W1918.1 Weathered shale	6'												
	"	66W1918.2 " "	12'												
	"	66W1918.3 Unweathered shale	17'												
1919x	252	Rock Core													
	"	66W1919X.1 Weathered Shale	7'												
	"	66W1919X.2 Unweathered Shale	13'												
	253	66W1919Y.1 Weathered Shale	7'												
	"	66W1919Y.2 Unweathered Shale	8'												
	"	66W1919Y.3 " "	13'												
1920	103.1	Borrow L.Bag	2-10'	GM	6	11	25	34	39	46	32	[illegible]	9	54	63
		(103) and 104.1 = 100,000 cu. yds)													
1921	104.1	" L.Bag	2-10'	GM	15	23	31	49	55	56	57	55	62	66	73
		Glacial Till													

)F AGRICULTURE
TION SERVICE

ANALYSIS AS PERCENT FINER BY DRY WEIGHT									ATTERBERG LIMITS		UNIFIED CLASS-IFICATION	SOLUBLE SALTS %	DIS-PERSION %	MOISTURE - DENSITY RELATIONSHIPS ☒ STANDARD ☐ MODIFIED			UNDISTURBED SAMPLE DATA		G_s
			GRAVEL																
	#10 2.0	#4 4.76	3/8" 9.525	1/2" 12.7	3/4" 19.05	1" 38.1	1 1/2" 28.4	3" 76.2 mm	LL	PI				CURVE NO.	DRY DENSITY ? IN LBS/FT³	OPTIMUM H_2O w IN %	? DRY UNIT WEIGHT g/cc	H_2O w IN %	
6	41	53?	61	70?	85?	93?	97	100	22?	5	GC GM								
2?	54	63	71	75	82?	[illegible]	92	100	22	3	GM			①	119.5	14.0			
32	56	73	80	83	88	91	93	100	30	10	CL			②	117.5	14.0			

MINUS # 4 FRACTION

66W1918.1 { GRAVEL FRACTION
2.78 APPARENT
2.56 BULK, DRY 159.? pcf
3.2 % ABSORPTION 73.6 [illegible]

MINUS # 4 FRACTION

66W1918.2 { GRAVEL FRACTION
2.79 APPARENT
2.63 BULK, DRY 164.1 pcf
2.2 % ABSORPTION
2.70

MINUS # 4 FRACTION

66W1917K.1 { GRAVEL FRACTION
2.77 APPARENT
2.55 BULK, DRY 159.1 pcf
3.1 % ABSORPTION
2.65 to 2.69

MINUS # 4 FRACTION

66W1919Y.1 { GRAVEL FRACTION
2.78 APPARENT
2.57 BULK, DRY 160.4 pcf
2.3 % ABSORPTION
2.65 to 2.69

DRY DENSITY < #4 MATERIAL ① 119.5 14.0

2.73 MINUS # 4 FRACTION ✓
GRAVEL FRACTION
2.71 APPARENT
2.62 BULK, DRY
1.4 % ABSORPTION

DRY DENSITY < #4 MATERIAL ② 117.5 14.0

2.74 MINUS # 4 FRACTION ✓
GRAVEL FRACTION
2.68 APPARENT
2.57 BULK, DRY
1.6 % ABSORPTION

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	TRIAXIAL SHEAR TEST

PROJECT and STATE: LITTLE CHURCH ST SITE No. 2-3 NEW YORK | SAMPLE LOCATION: BOREDOM

FIELD SAMPLE NO.: 103.1 | DEPTH: 2.0' | GEOLOGIC ORIGIN:

TYPE OF SAMPLE: DISTURBED | TESTED AT: LINCOLN | APPROVED BY: | DATE:

INDEX TEST DATA

USCS SM; LL 22; PI 3

% FINER (mm): 0.002 6; 0.005 11; 0.074 (#200) 39

G_s (-#4) 2.73; G_s (+#4)

STANDARD: γ_d MAX. 119.5 pcf; w_o 12.0%

MODIFIED: γ_d MAX. _____ pcf; w_o _____%

SPECIMEN DATA

HEIGHT 3.0"; DIAMETER 1.4"

MATERIALS TESTED PASSED #4 SIEVE

METHOD OF PREPARATION STATIC MIXED IN 3 LIFTS

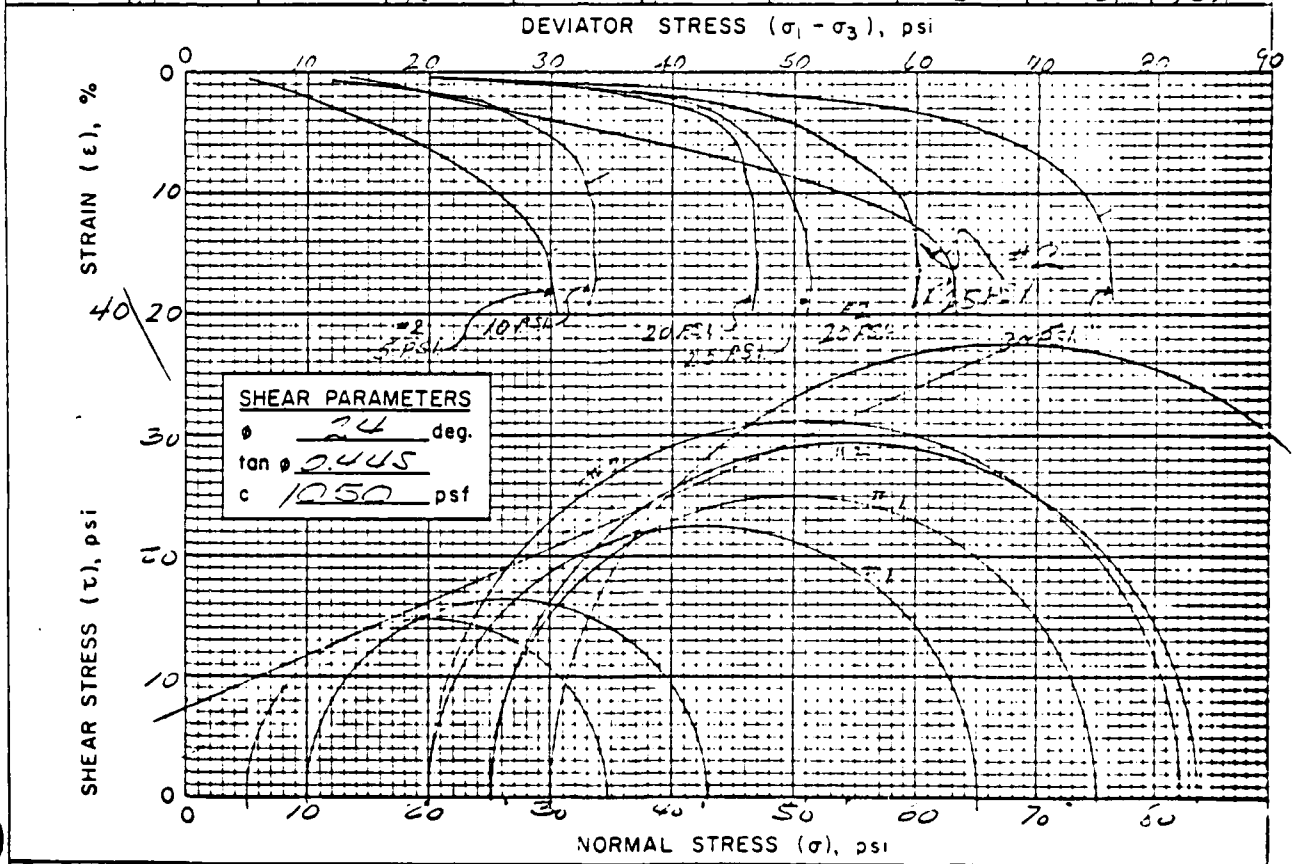
MOLDING MOISTURE 14.7%

MOLDED AT 94.2% OF γ_d MAXIMUM

TYPE OF TEST

UU ☐ CU ☑ $\overline{CU}$ ☐ CD ☐

DRY DENSITY			MOISTURE CONTENT, %						
INITIAL pcf ☑ g/cc ☐	CONSOLIDATED pcf ☑ g/cc ☐		START OF TEST	DEG. OF SAT. AT START OF TEST	END OF TEST	TIME OF CONSOLIDATION (hrs)	MINOR PRINCIPAL STRESS σ_3 (psi)	DEVIATOR STRESS $\sigma_1 - \sigma_3$ (psi)	AXIAL STRAIN AT FAILURE, ε (%)
113.6	115.5		17.6	96.2	16.7	6.93	10	[illegible]	[illegible]
114.2	116.1		17.6	97.8	16.6	6.42	20	45.1	5.7
111.7	114.9		18.5	96.4	16.8	6.13	25	51.0	4.0
113.6	117.4		17.7	96.7	16.0	6.65	30	75.0	11.9
114.9	119.2		16.0	90.0	16.2	16.53	25	58.7	10.4



REMARKS AVERAGE TEST DENSITY = 113.3 PCF OR 94.8% STD. ad MAX.
Note:- Slope of shear envelope by least squares

29°
60
30.5°
45

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	TRIAXIAL SHEAR TEST

PROJECT and STATE: LITTLE COCONUT SITE No. 2-S NEW MEX | SAMPLE LOCATION: EDDY

FIELD SAMPLE NO.: 1021 | DEPTH: 2.0' | GEOLOGIC ORIGIN:

TYPE OF SAMPLE: DISTURBED | TESTED AT: LINCOLN | APPROVED BY: | DATE:

INDEX TEST DATA

USCS GM ; LL 22 ; PI 3

% FINER (mm): 0.002 6 ; 0.005 11 ;

0.074 (#200) 39

G_s (-#4) 2.73 ; G_s (+#4) _____

STANDARD: γ_d MAX. 119.5 pcf; w_o 12.0 %

MODIFIED: γ_d MAX. _____ pcf; w_o _____ %

SPECIMEN DATA

HEIGHT 3.0 "; DIAMETER 1.4 "

MATERIALS TESTED PASSED 3/4" SIEVE

METHOD OF PREPARATION MOLDED

BY KNEADING IN 5 LIFTS

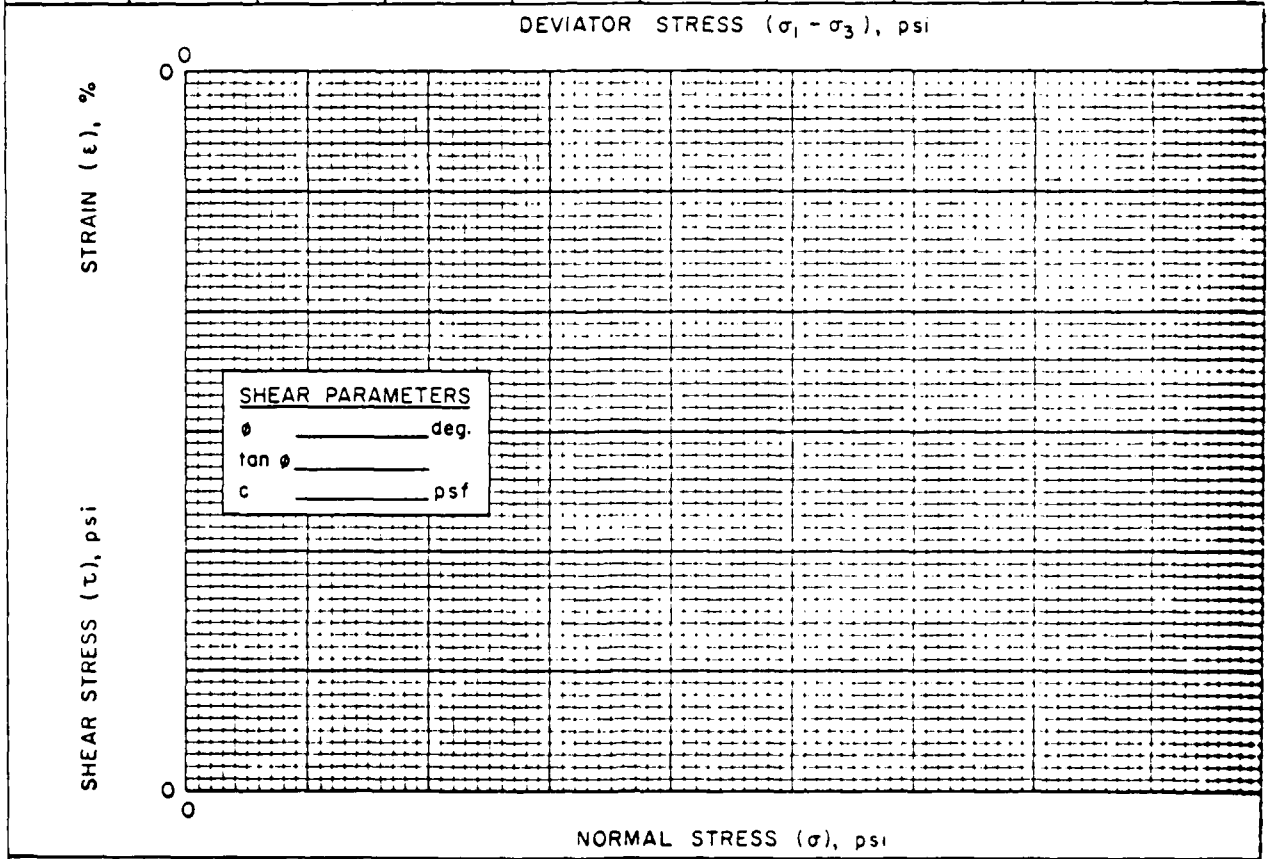
MOLDING MOISTURE 16.6 %

MOLDED AT 95.5 % OF γ_d MAXIMUM

TYPE OF TEST

UU ☐ CU ☑ $\overline{CU}$ ☐ CD ☐

DRY DENSITY			MOISTURE CONTENT, %			TIME OF CONSOLI-DATION (hrs)	MINOR PRINCIPAL STRESS σ_3 (psi)	DEVIATOR STRESS $\sigma_1 - \sigma_3$ (psi)	AXIAL STRAIN AT FAILURE, ε (%)
INITIAL pcf ☑ g/cc ☐	CONSOLI-DATED pcf ☑ g/cc ☐		START OF TEST	DEG. OF SAT. AT START OF TEST	END OF TEST				
114.2	117.2		16.5	91.7	15.2	16.33	5	59.7	15
114.2	119.2		16.7	92.8	14.3	16.15	20±2	62.5	15



REMARKS Supplement to 1 of 2
Molded at saturation

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	TRIAXIAL SHEAR TEST

PROJECT and STATE: [illegible] SITE NO. 2 [illegible] | SAMPLE LOCATION: Ecorse

FIELD SAMPLE NO: 1-U-1 | DEPTH: 2.0 - 10.0 ' | GEOLOGIC ORIGIN:

TYPE OF SAMPLE: Undisturbed | TESTED AT: Lincoln | APPROVED BY: | DATE:

INDEX TEST DATA

USCS CL ; LL 30 ; PI 10

% FINER (mm): 0.002 15 ; 0.005 23 ; 0.074 (#200) 55

G_s (-#4) 2.74 ; G_s (+#4)

STANDARD: γ_d MAX. 117.5 pcf; w_o 14.0 %

MODIFIED: γ_d MAX. ____ pcf; w_o ____ %

SPECIMEN DATA

HEIGHT 3.0 "; DIAMETER 1.4 "

MATERIALS TESTED PASSED #4 SIEVE

METHOD OF PREPARATION Static Compaction - 3 Layers

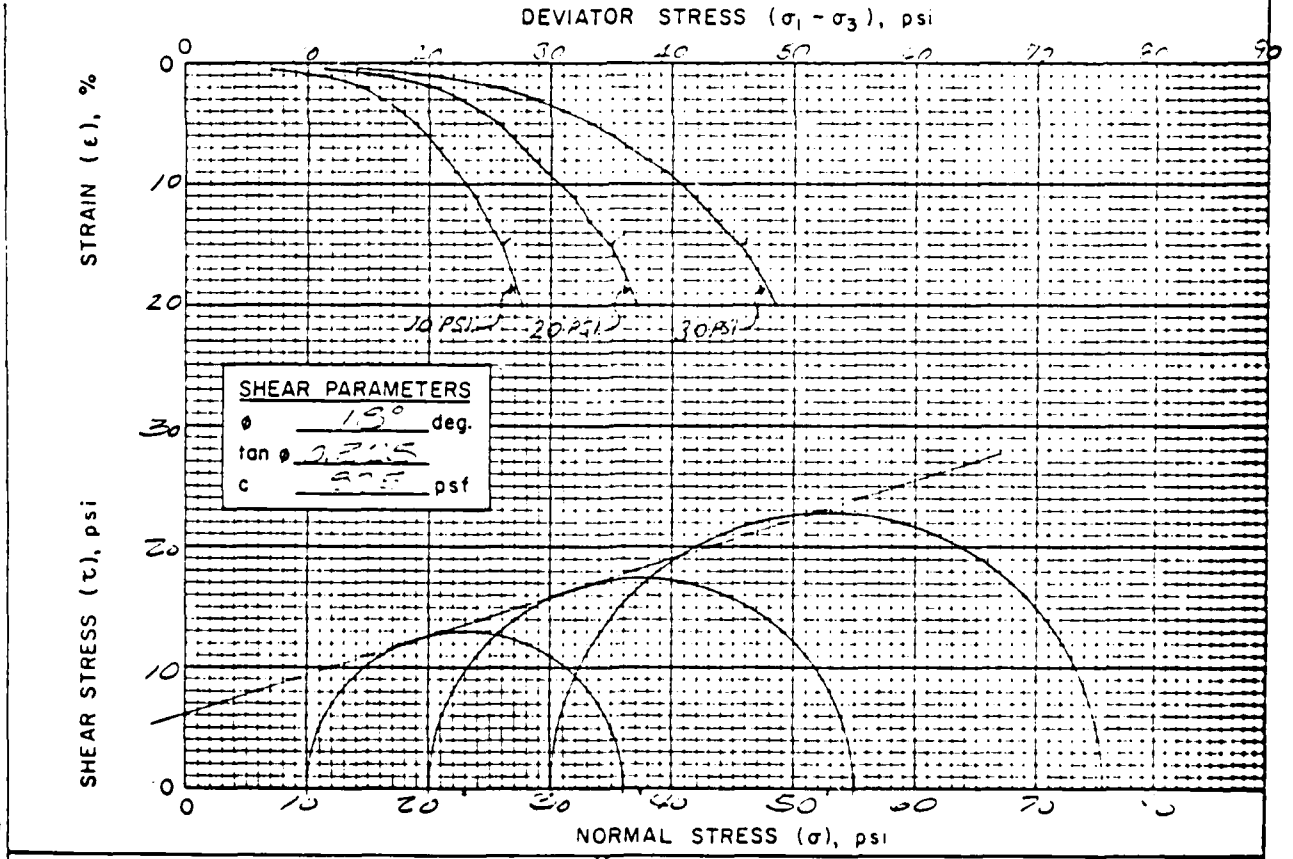
MOLDING MOISTURE 17.0 %

MOLDED AT 94.7 % OF γ_d MAXIMUM

TYPE OF TEST

UU ☐ CU ☑ $\overline{CU}$ ☐ CD ☐

DRY DENSITY			MOISTURE CONTENT, %			TIME OF CONSOLI-DATION (hrs.)	MINOR PRINCIPAL STRESS σ_3 (psi)	DEVIATOR STRESS $\sigma_1 - \sigma_3$ (psi)	AXIAL STRAIN AT FAILURE, ε (%)
INITIAL pcf ☒ g/cc ☐	CONSOLI-DATED pcf ☒ g/cc ☐		START OF TEST	DEG. OF SAT. AT START OF TEST	END OF TEST				
110.5	111.7		18.9	94.5	18.4	6.35	10	25.9	15
111.1	112.4		18.7	94.9	17.8	6.07	20	34.9	15
111.7	113.6		18.6	95.9	17.5	6.38	30	45.5	15



REMARKS Average Test γ_d = 94.6% std.

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	COMPACTION AND PENETRATION RESISTANCE

PROJECT and STATE: Little Chicopee #2-3, New York

FIELD SAMPLE NO	LOCATION	DEPTH
1021	Borrow	2'-10'

GEOLOGIC ORIGIN	TESTED AT	APPROVED BY	DATE
	C.M.L. Lincoln		

CLASSIFICATION CL LL 30 PI 10 — CURVE NO. 2 OF 2

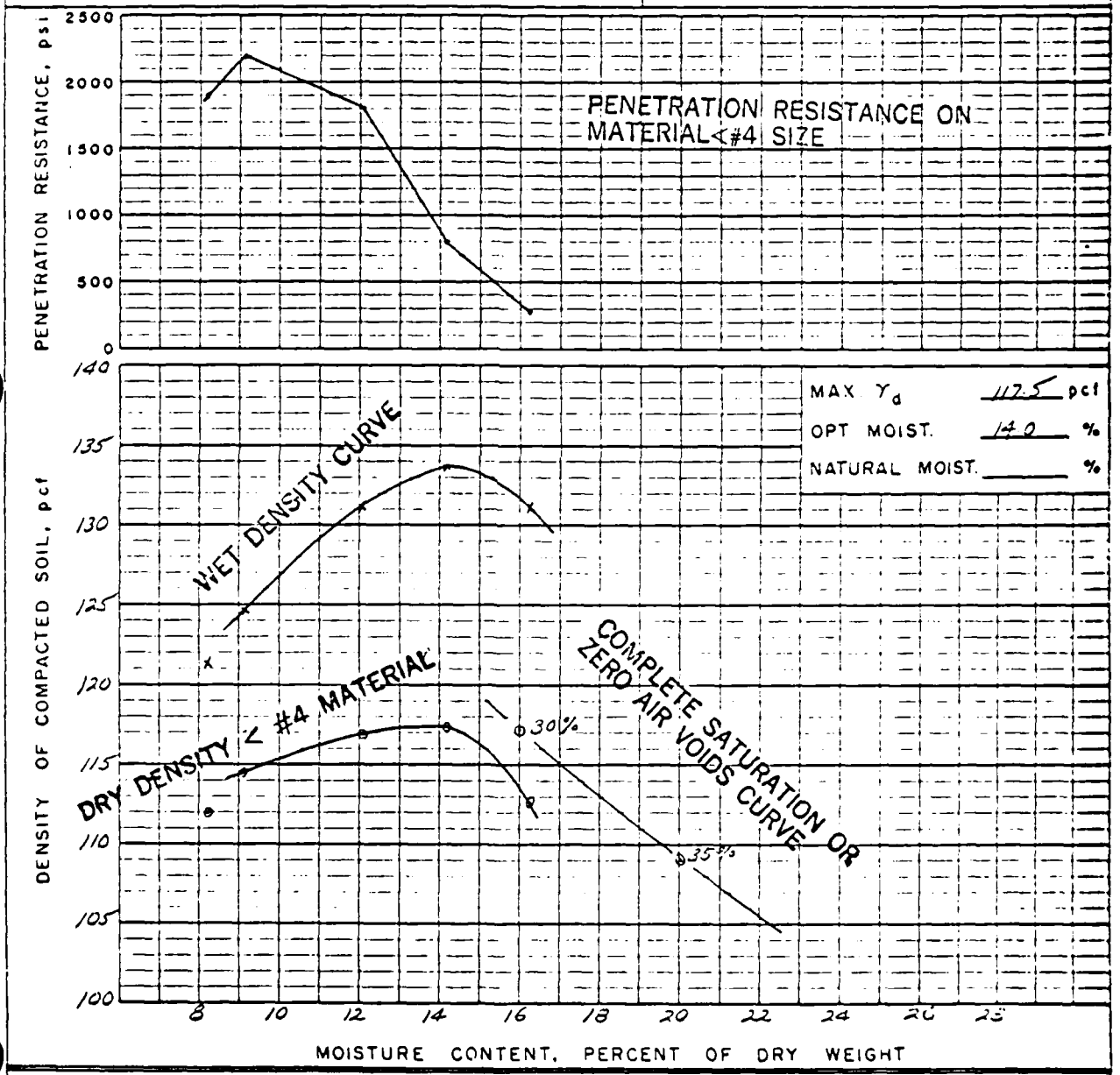
MAX. PARTICLE SIZE INCLUDED IN TEST < #4 "

SPECIFIC GRAVITY (G_s) { MINUS NO. 4 2.74 / PLUS NO. 4 2.65

STD. (ASTM D-698) ☒; METHOD A

MOD. (ASTM D-1557) ☐; METHOD

OTHER TEST ☐ (SEE REMARKS)



REMARKS

MATERIALS TESTING REPORT	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	COMPACTION AND PENETRATION RESISTANCE

PROJECT AND STATE: Little Cascade #2 P, New York

FIELD SAMPLE NO	LOCATION	DEPTH
103-1	Borrow	2'-10'

GEOLOGIC ORIGIN	TESTED AT	APPROVED BY	DATE
	S.M.L. Lincoln		

CLASSIFICATION GM LL 22 PI 3

MAX. PARTICLE SIZE INCLUDED IN TEST < #4 "

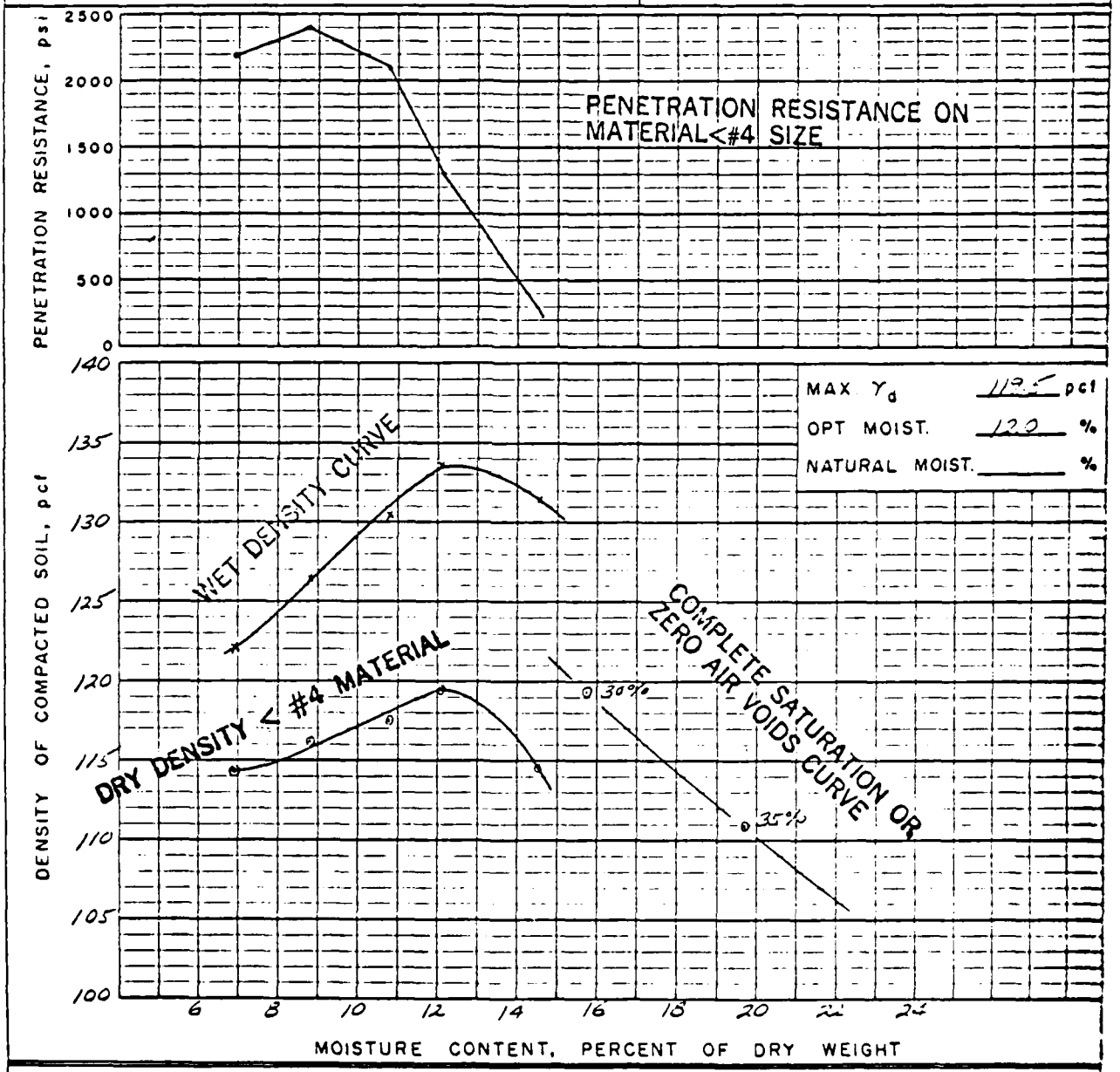
SPECIFIC GRAVITY (G_s) { MINUS NO. 4 2.73 ; PLUS NO. 4 2.71

CURVE NO. 1 OF 2

STD. (ASTM D-698) ☒; METHOD A

MOD. (ASTM D-1557) ☐; METHOD

OTHER TEST ☐ (SEE REMARKS)



REMARKS

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	SUMMARY - SLOPE STABILITY ANALYSIS

PROJECT and STATE: TITLE CIRCUIT SITE #B-2 NEW YORK — DATE: 2-11-66

METHOD OF ANALYSIS: SWEDISH CIRCLE — ANALYZED AT: S.C.S. - LINCOLN — APPROVED BY:

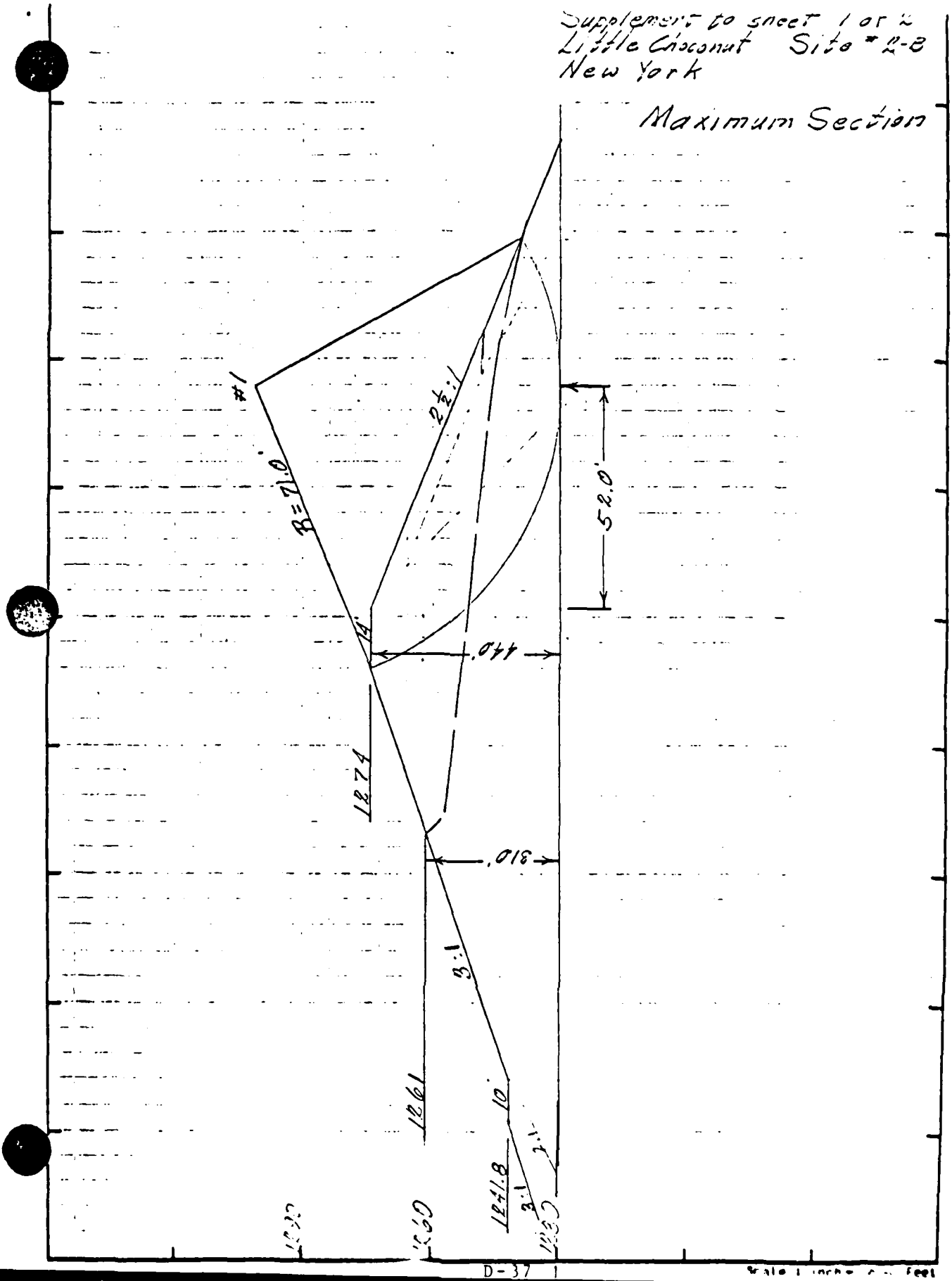
TRIAL NO.	SLOPE	CONDITIONS	F_s
1	2½:1	MAXIMUM SECTION DOWNSTREAM No drain - No berm - Arc cut from app solar plan Full pool only.	2.2

	SOURCE AND USE OF MATERIALS	CLASSIFICATION	ADOPTED DESIGN DATA: γ_d (pcf)	γ_m (pcf)	γ_{sol} (pcf)	γ_{sub} (pcf)	ϕ (deg)	$\tan\phi$	c (psf)	REMARKS
①	Berm Emb	CL	122.1	122.5	132.2		18°	0.325	925	Soil strength tests.
②	Borrow Emb	CH	129.0	139.5	144.2		24°	0.445	1050	
③										
④										
⑤										
⑥										
⑦										
⑧										

Sheet ___ of ___

Supplement to sheet 1 of 2
Little Coconut Site #2-B
New York

Maximum Section



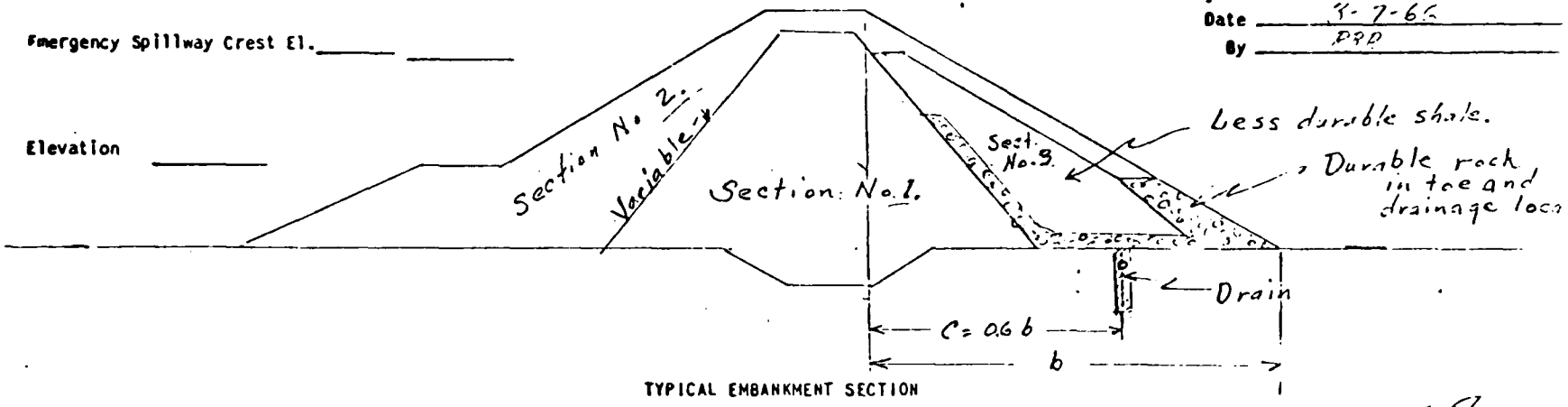
SCS-372
(3/59)

U. S. DEPARTMENT OF AGRICULTUR
SOIL CONSERVATION SERVICE

RECOMMENDED USE OF EXCAVATED MATERIAL

☐ Formal Zoning Plan ☒ Selective Placement Plan

State New York
Project [illegible]
Date 5-7-66
By PPP



TYPICAL EMBANKMENT SECTION

95 % Std.

Embankment Section		Source of Fill Material			Lab. Sample No.	Lab Test		Lab. Curve No.	Compaction Requirements Class of Fill	
Sec. No.	Description	Location	Ave. Depth From	Ave. Depth To		Standard Max. Den.	Standard Optm. Moist.		Minimum Density Lbs. per Cu.Ft.	Moisture Range Percent From / To
1.	Center section	Gravelly Cl. Borrow (103.1)	2	10	SCS W 1921	117.5	14.0	2	* 120.0	
2.	Outside section	GM Borrow (103.1)	2	10	SCS W 1920	119.5	12.0	1	* 127.0	
2.	Downstream section	E. Spillway rock (251+252)	6	13	SCS W 1918	**				
					SCS W 1919					
	* Rock correction made for placement in [illegible]									
	** Place by equipment use specified [illegible]									

M E M O R A N D U M

December 13, 1966

RECEIVED
ASST. SUPT.
CHIEF, OPER. & MAINT.
WATERSHED DIVISION

TO: Mr. J. R. Stellato
Acting Asst. Supt. of Oper. & Maint.

Attention: Mr. A. Dickinson

FROM: Mr. Wm. P. Hofmann, Director
Bureau of Soil Mechanics

SUBJECT: Finch Hollow, Little Choconut & Trout Brook Watershed Project
Floodwater Retarding Dam No. 2-B
Broome County

Referred to:
[illegible]
[illegible]tion
[illegible]
[illegible] Plant
[illegible]
[illegible]
File

In accordance with your request, we have reviewed the design of the above floodwater retarding dam from the soil mechanics standpoint. Our review was based on the information contained in plans and specifications prepared by the Soil Conservation Service of the U.S. Department of Agriculture.

We offer the following comments and recommendations to the plans and specifications:

1. Sheet two of the plans indicates a supplemental borrow area upstream of the dam. It is our opinion that no borrow should be allowed within a distance of four hundred (400) feet of the C/L of the dam.

2. As the zoned dike on Sheet 5 is presently designed, it is possible that water pressure could build up at the interface of zone 1 and zone 2 due to a heavy rainfall or a sustained flow through the emergency spillway. We recommend that a positive method of drainage be incorporated in the plans to alleviate this condition.

3. The drainage trench or toe drain would be better located approximately halfway between the centerline and the downstream toe of the dam. This change is recommended to improve the seepage conditions in and beneath the dam.

4. In order to prevent possible future settlements, the drain fill in the area of the impact basin should be compacted.

We are returning the plans, specifications and various reports for this dam but request that any revised information based on the above recommendations be again made available for our review.

Wm. P. Hofmann, Director
Bureau of Soil Mechanics

EMM/mfk

cc: Mr. G. W. McAlpin

PREVIOUS INSPECTION REPORTS

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Chemung County Rural Urban Center, P.O. Box 353, Breesport, N.Y. 14816

SUBJECT ENG - 40 Inspection of Dam Sites; Nanticoke 9A, Little Choconut 2C, 6B, 2E

DATE September 19, 1979

TO Herbert J. Lyford, Area Conservationist

On September 11, 1979 and September 12, 1979, I inspected the above structures to conform to Administrator's General Memorandum-16. Dick Crowe and Dan Walker accompanied me on the 11th and only Dan Walker on the 12th.

Hazard classification was not reviewed since all the structures were already hazard class C.

Overall the operation and maintence was good. The only item I question is whether the mowing of the dam slopes will eventually kill the crown vetch. I understand that crown vetch should not be mowed annually.

On all structures the condition of the principal spillway system was the major item inspected. The slopes of the dam and the emergency spillway were looked at for any seeps or slips.

I did not have copies of the construction as-builts or of previous inspection reports available when the inspections were made. I recommend that these be on site during future inspections.

All the sites inspected with impact basins had evidence of deterioration of the joint filler around the outlet of the conduit. This should be checked annually for loss of soil from behind the back wall of the impact basin.

Attached are the individual reports for the above structures.

Dana C. Chapman, P.E.
Project Engineer

cc L. Thomas, R. Crowe, C. Page, R. Perritt

enc.

LITTLE CHOCONUT WATERSHED SITE 2B
Inspection Report
September 12, 1979

Principal Spillway Pipe
Only joint gaps greater then $\frac{1}{4}$" are listed below

Joint Number From Construction Drawings	Location of measurement (looking downstream)
5	12 o'clock $\frac{1}{2}$", 6 dclock $\frac{1}{2}$", 9 o'clock 5/8"
6	12 dclock $\frac{1}{2}$", 3 O'clock 3/8"
7	4 o'clock 3/8"
8	12 o'clock 3/8", 3 o'clock 3/8", 6 o'clock 3/8"
9	3/8" gap all around
12	12 O'clock 5/8"
13	8 o'clock 3/8"
14	3 o'clock 3/8"
Maximum joint Extensibility	2 3/4"

Riser OK

Impact Basin
Minor flow from both drainage system drains.

Embankment and emergency spillway are OK

Dana C. Chapman

Dana C Chapman

OPERATIONS & MAINTENANCE 1980 REPORT
BROOME COUNTY SOIL & WATER CONSERVATION DISTRICT

PL-566 Sites

1. Little Choconut #1
   - Mowed dike and emergency spillway
   - Removed debris from riser and pool area
   - Operated gate

2. Little Choconut #1A
   - Mowed dike and emergency spillway
   - Operated gate
   - Removed debris from riser and pool area

3. Little Choconut #2
   - Replaced stone-lined waterway - installed 482 tons
   - Removed sediment from pool - 150 c.y.
   - Mowed dike and emergency spillway
   - Debris removed from riser and pool area
   - Operated gate

4. Little Choconut #2A
   - Repaired barbed wire fence
   - Mowed dike and emergency spillway
   - Operated gate
   - Removed debris from riser and pool area
   - Replaced gate

5. Little Choconut #2B
   - Mowed dike and spillway
   - Operated gate
   - Removed debris from riser and pool area

6. Little Choconut #2C
   - Mowed dike and spillway
   - Operated gate
   - Repaired fence
   - Installed gate on access road
   - Removed debris from riser and pool area

7. Little Choconut #2E
   - Mowed dike and emergency spillway
   - Operated gate
   - Removed debris from riser and pool area

8. Little Choconut #3C
   - Mowed dike and spillway
   - Operated gate
   - Repaired gate
   - Attempted to unplug 6" drain into riser, will require pumping dry and dredging to uncap pool end

ENGINEERING OPERATIONS AND MAINTENANCE INSPECTION REPORT

WATERSHED Clermont SITE NO. 2B DATE OF INSPECTION [illegible] DATE OF LAST INSP. _____

SPONSOR WITH OPERATIONS AND MAINTENANCE RESPONSIBILITY Barnes SWCD

PRESENT HAZARD CLASSIFICATION C NEW CLASSIFICATION IF WARRANTED C

O & M ITEMS	SATISFACTORY/UNSATISFACTORY • EXPLANATION
1. VEGETATION	
a.) Mowing	S /a.)
b.) Reseeding	S /b.)
c.) Fertilising	S /c.)
d.) Excessive other uses	S /d.)
2. FENCING	
a.) Intact and Functional	S /a.)
b.) Debris in Fence	S /b.)
c.) Gates, Locks	S /c.)
3. EMERGENCY SPILLWAY	
a.) Erosion	S /a.)
b.) Excessive Seepage	S /b.)
c.) Sedimentation	S /c.)
d.) Obstructions in Channel	S /d.)
e.) Slips, Slides; Location	S /e.)
4. EMBANKMENT	
a.) Cracking, excessive settling	S /a.)
b.) Erosion	S /b.)
c.) Seepage	S /c.)
d.) Other Damage (Rodents...)	S /d.)

O & M ITEMS	SATISFACTORY/UNSATISFACTORY - EXPLANATION
5. RESERVOIR AREA	
a.) Undesirable Vegetation	S * /a.) CATTAILS
b.) Cut or Fallen Trees	S /b.)
c.) Debris/Slash	S /c.)
d.) Sedimentation	S /d.)
6. OUTLET CHANNEL	
a.) Sedimentation	/a.)
b.) Cutting and Scouring	S /b.)
c.) Woody Growth	/c.)
7. ROCK RIPRAP	
a.) Undermining	/a.)
b.) Adjacent Channel Scouring	/b.)
c.) Deterioration	/c.)
8. TRASH RACKS, GRATINGS	
a.) Accumulated Debris	S /a.)
b.) Broken or Missing Parts	S /b.)
c.) Galvanising or Paint	S /c.)
9. OTHER SPECIAL STRUCTURES	
a.) Diversions	/a.)
b.) Access Roads	S /b.)
c.) Waterways	S /c.)
d.) Other, list.....	/d.)
e.) Other, list.....	/e.)
10. PRINCIPLE SPILLWAY	
a.) Riser	
1.) Condition of Concrete	S /1.)
2.) Seepage and Cracks	S /2.)
3.) Condition of Transition	S /3.)

O & M ITEMS	SATISFACTORY/UNSATISFACTORY - EXPLANATION
10. PRINCIPLE SPILLWAY	
b.) Impact Basin	
1.) Condition of Concrete	S /1.)
2.) Sedimentation, Debris	S /2.)
3.) Pipe Entrance Condition	S /3.) CRACK AROUND PIPE @ E
c.) Plunge Pool	
1.) Riprap Condition	S /1.)
2.) Vegetative Treatment	S /2.)
d.) Drain System	
1.) Seepage (Clean, Dirty)	S /1.)
2.) Animal Guards	S /2.)
e.) Pipe	
1.) Cracks, Seepage	/1.)
2.) Debris and Sedimentation	/2.)
3.) Listing of gaps greater than 3/8 inch.	Maximum joint extensibility

JOINT #	
12 O'Clock	
3 O'Clock	
6 O'Clock	
9 O'Clock	

Gap locations as looking downstream.

11. GATES AND VALVES

Estimated leakage with gate closed and adjusted ~2 gpm.

General description of system GATE IS SLUICE GATE

Operational Check: Satisfactory ✓ UNSATISFACTORY

12. PUMP SYSTEMS

General condition report, including operations record, fuses broken or missing, broken or missing warning lights, faulty switches, lubrication required, excessive vibration:

12. PUMP SYSTEMS

General condition report, continued:---------

13. SAFETY

List all hazards present: (including broken guards, rails, rope swings, diving boards on risers, evidence of pollution, garbage)

RECOMMENDED REPAIRS AND METHOD OF REPAIR: Remove cattails & sediment from pool area. Repair fence on west side. Remove & haul away debris.

INSPECTED BY R. Wilson

TITLE District Manager

DUTY STATION Bainbridge F.C.

NOTE: DESIGNATE NOT APPLICABLE ITEMS BY MARKING N/A.

DAM INSPECTION REPORT
(By Visual Inspection)

Dam Number	River Basin	Town	County	Hazard Class*	Date & Inspector
96A-3630	Susq.	Maine	Broome	B	5/28/76 KVH

Type of Construction

- ☐ Earth w/concrete spillway
- ☑ Earth w/drop inlet ~~pipe~~ Conc.
- ☐ Earth w/stone or riprap spillway
- ☐ Concrete
- ☐ Stone
- ☐ Timber

Use

- ☐ Water Supply
- ☑ ~~Power~~ Flood Control
- ☐ Recreation
- ☐ Fish and Wildlife
- ☐ Farm Pond
- ☐ No Apparent Use-Abandoned

Estimated Impoundment Size

- ☐ 1-5 acres
- ☐ 5-10 acres
- ☑ Over ~~10~~ acres 30 Max.

Estimated Height of Dam above Streambed

- ☐ Under 10 feet
- ☐ 10-25 feet
- ☑ Over 25 feet 45'

Condition of Spillway

- ☑ Service satisfactory
- ☐ In need of repair or maintenance
- ☑ Auxiliary satisfactory
- ☐ In need of repair or maintenance

Explain: _____

_____

Condition of Non-Overflow Section

- ☑ Satisfactory
- ☐ In need of repair or maintenance Explain: _____

_____

Condition of Mechanical Equipment

- ☑ Satisfactory
- ☐ In need of repair or maintenance Explain: _____

_____

Evaluation (From Visual Inspection)

- ☑ No defects observed beyond normal maintenance
- ☐ Repairs required beyond normal maintenance

*Explain Hazard Class, if Necessary _____

_____

APPENDIX E

REFERENCES

REFERENCES

1. Chow, Ven Te, Editor - Handbook of Applied Hydrology. McGraw-Hill Book Company, New York, N.Y., 1964.

2. Hydrologic Engineering Center, U.S. Army Corps of Engineers, "HEC-1 Flood Hydrograph Package, Users Manual". Davis, Cal., January 1973.

3. Hydrologic Engineering Center, U.S. Army Corps of Engineers, "Flood Hydrograph Package (HEC-1), Users Manual for Dam Safety Investigations", Davis, Cal., September 1978.

4. King, Horace, and Brater, Ernest. Handbook of Hydraulics, 5th Edition. McGraw-Hill Book Company, New York, N.Y., 1963.

5. U.S. Department of the Interior. Design of Small Dams, 2nd Edition, Washington, D.C., 1973.

APPENDIX F

DRAWINGS

FINCH HOLLOW, LITTLE CHOCONUT & TI
WATERSHED PROJECT

FLOODWATER RETARDING DAM NO. 2-E

DRAINAGE AREA	1024 ACRES
TOTAL STORAGE (TO EMERGENCY SPILLWAY CREST)	212 ACRE
WATER SURFACE AREA (AT SEDIMENT POOL)	4 ACRES
HEIGHT OF DAM	45 FEET
VOLUME OF FILL	~~102,000~~ 105,281 CUBIC

BUILT UNDER THE WATERSHED PROTECTION A
FLOOD PREVENTION ACT

BY

COUNTY OF BROOME

WITH THE ASSISTANCE OF THE

SOIL CONSERVATION SERVICE

OF THE

U S. DEPARTMENT OF AGRICULTURE

AS BUILT

SHEET 1 - COVER SHEET
SHEET 2 - PLAN OF STORAGE & BORROW AREA
SHEET 3 - PLAN OF STRUCTURAL WORKS
SHEET 4 - PROFILES
SHEET 5 - FILL PLACEMENT
SHEET 6 - LAYOUT DATA & PROFILES
SHEET 7,8 - DRAINAGE SYSTEM DETAILS & EXCAVATION SECTIONS
SHEET 9 - PLAN AND PROFILE OF PRINCIPAL SPILLWAY
SHEET 10 - PLAN AND PROFILE OF PRINCIPAL SPILLWAY
SHEET 11 - RISER STRUCTURAL DETAILS
SHEET 12 - RISER STRUCTURAL DETAILS
SHEET 13 - RISER STRUCTURAL DETAILS
SHEET 14 - TRASH RACK & SMALL ANIMAL GUARD DETAILS
SHEET 15 - CONDUIT DETAILS
SHEET 16 - IMPACT BASIN DETAILS
SHEET 17 - POND DRAIN INLET DETAILS
SHEET 18, 9-1005 OF TEST HOLES

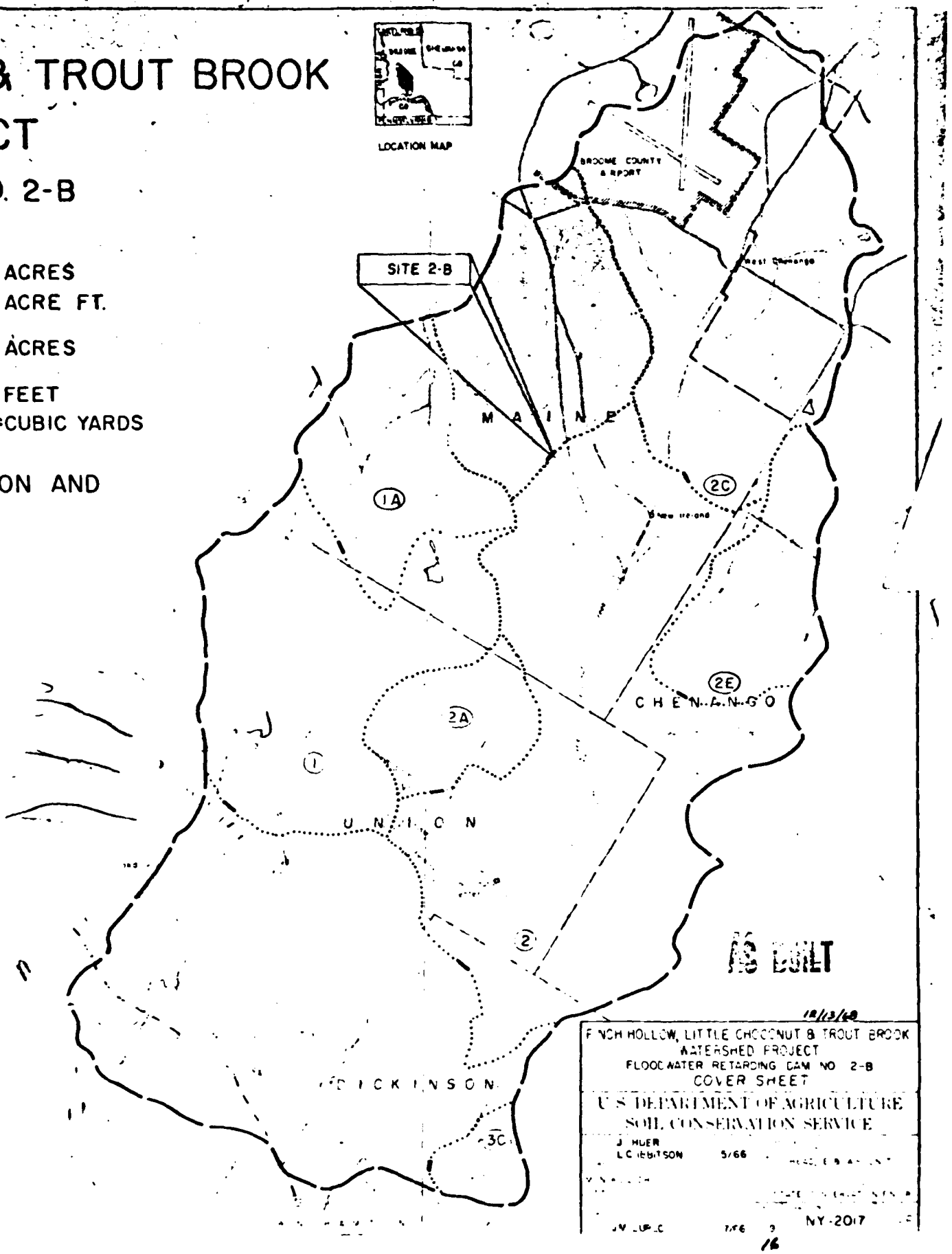
NUT & TROUT BROOK
ROJECT
DAM NO. 2-B

1024 ACRES
212 ACRE FT.
4 ACRES
45 FEET
~~102,000~~ 105,281 CUBIC YARDS

PROTECTION AND
ACT

F THE
RVICE

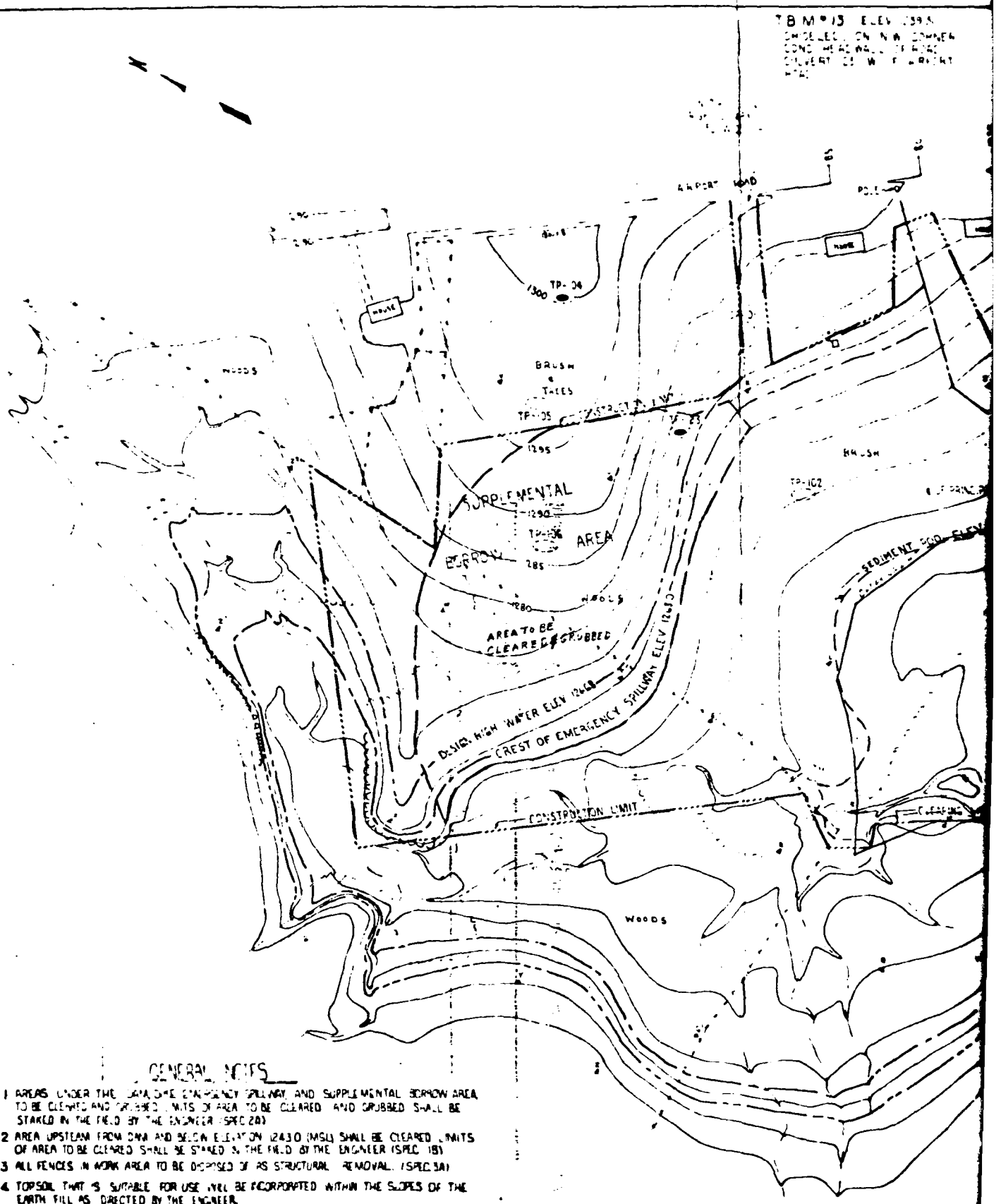
CULTURE



AS BUILT

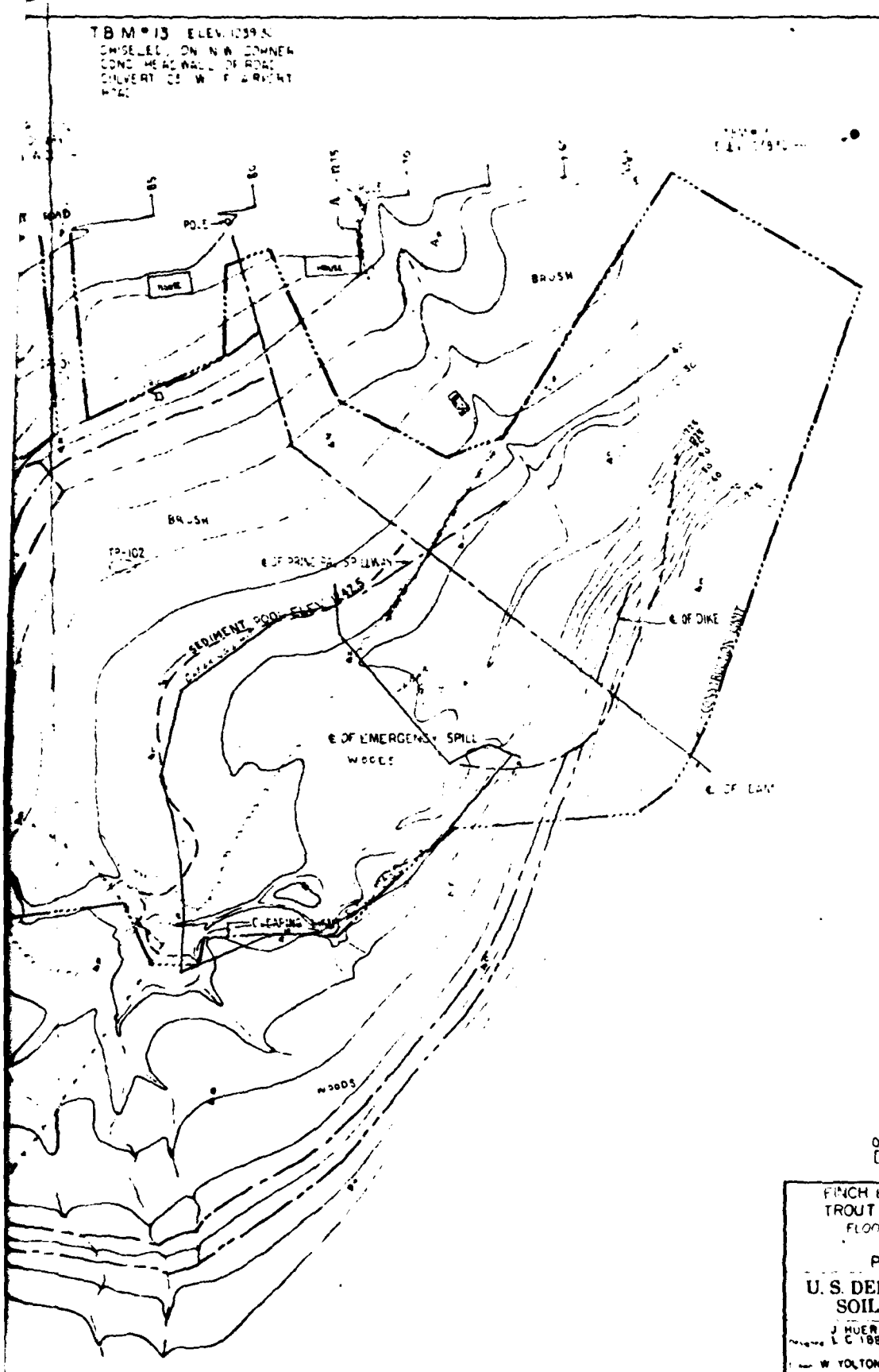
10/13/60

FINCH HOLLOW, LITTLE CHOCONUT & TROUT BROOK
WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 2-B
COVER SHEET
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
J HUER
L C IBBITSON 5/66
NY-2017
16



GENERAL NOTES

1. AREAS UNDER THE DAM, THE EMERGENCY SPILLWAY, AND SUPPLEMENTAL BORROW AREA TO BE CLEARED AND GRUBBED. LIMITS OF AREA TO BE CLEARED AND GRUBBED SHALL BE STAKED IN THE FIELD BY THE ENGINEER (SPEC 2B)
2. AREA UPSTREAM FROM DAM AND BELOW ELEVATION 1243.0 (MSL) SHALL BE CLEARED. LIMITS OF AREA TO BE CLEARED SHALL BE STAKED IN THE FIELD BY THE ENGINEER (SPEC 1B)
3. ALL FENCES IN WORK AREA TO BE DISPOSED OF AS STRUCTURAL REMOVAL. (SPEC 3A)
4. TOPSOIL THAT IS SUITABLE FOR USE WILL BE INCORPORATED WITHIN THE SLOPES OF THE EARTH FILL AS DIRECTED BY THE ENGINEER.



AS BUILT

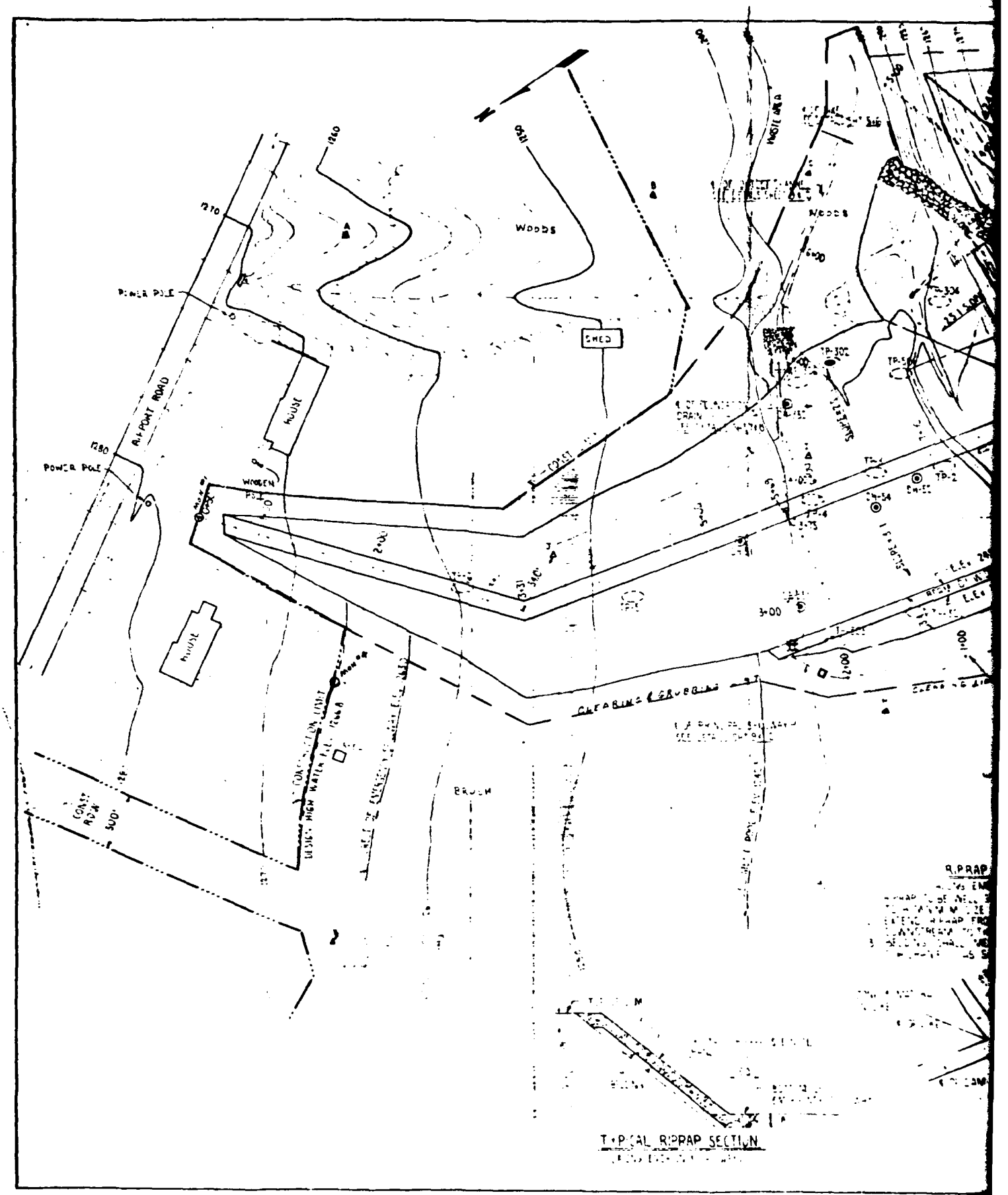
0 50 100 200 FT
SCALE

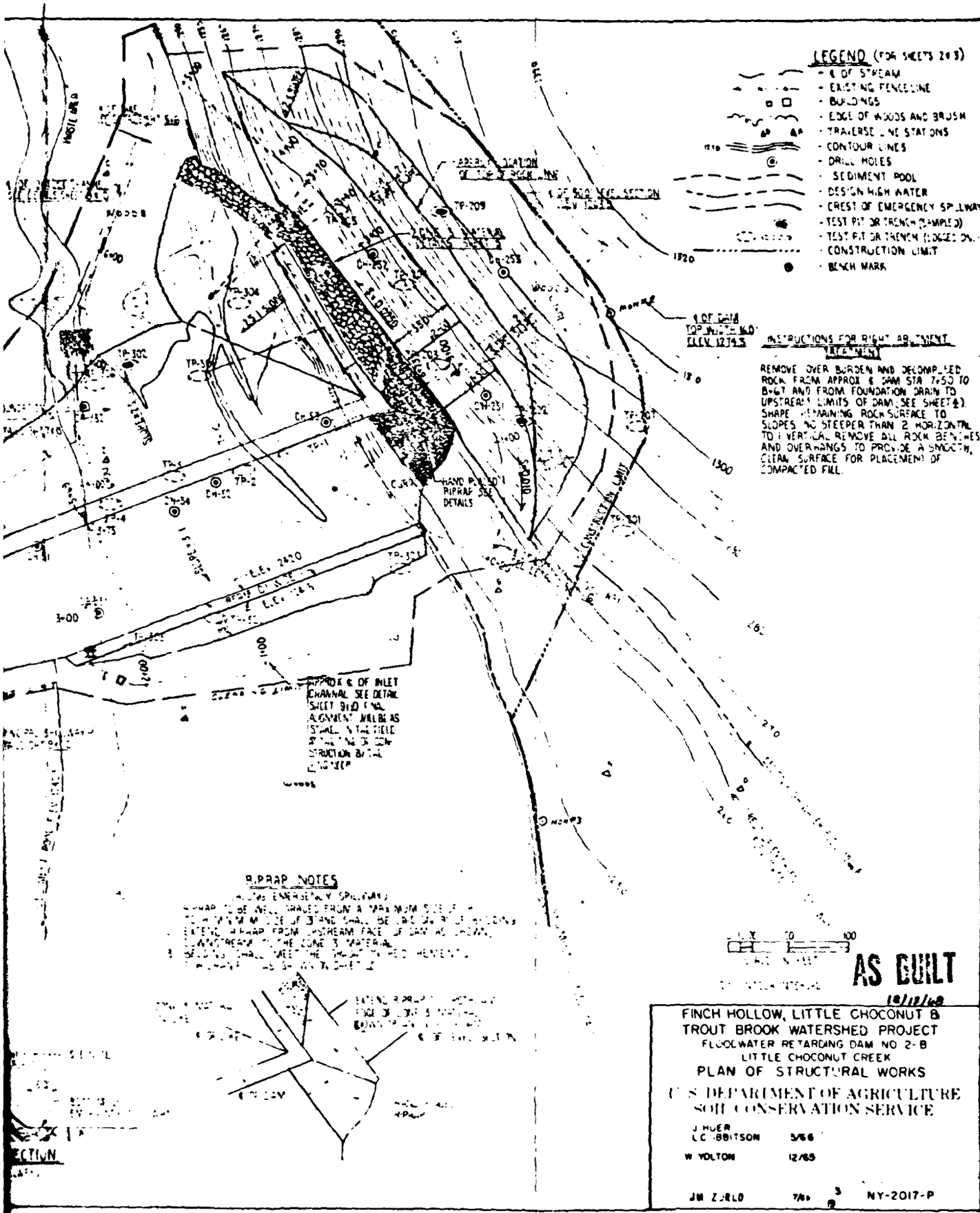
12/13/68

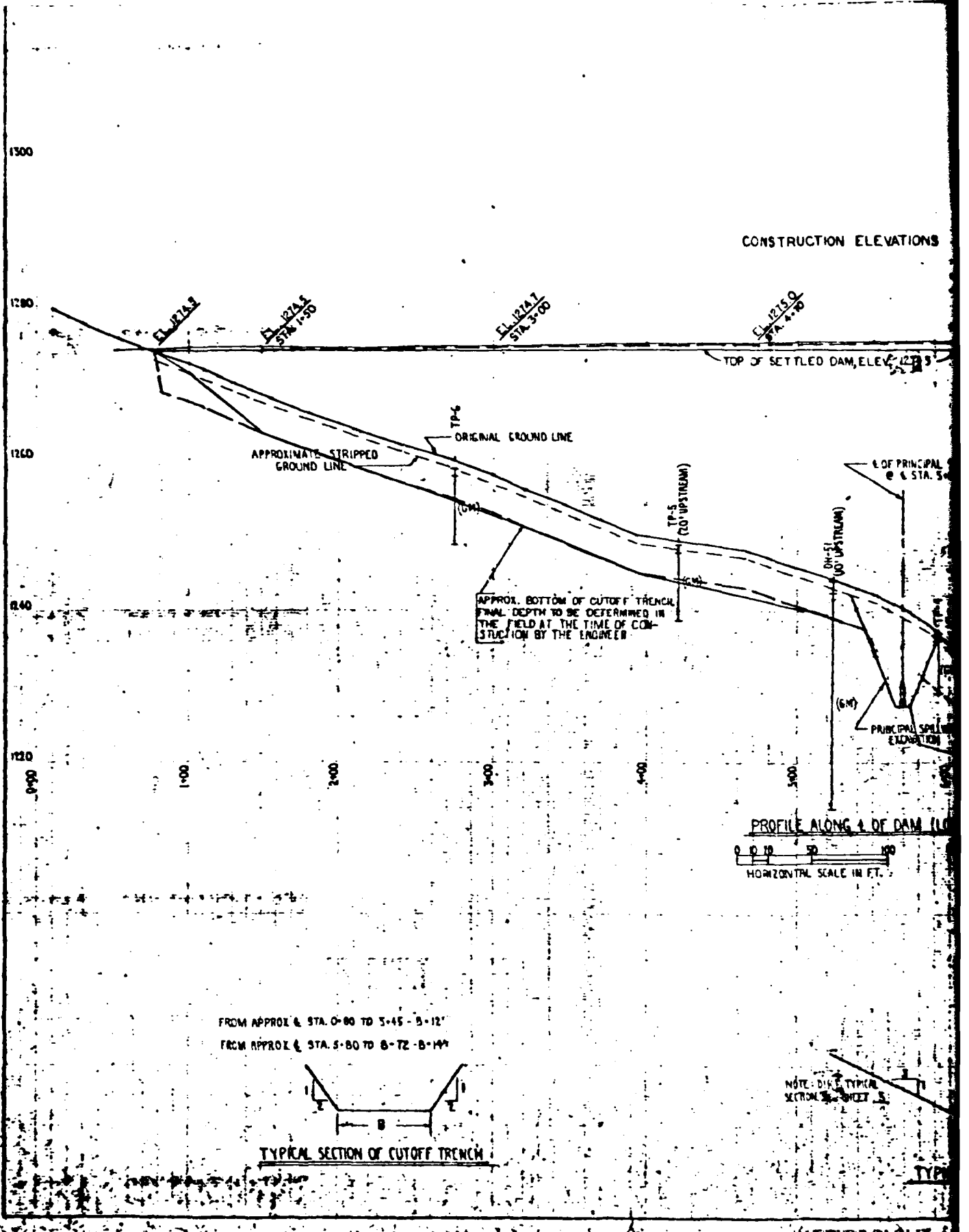
FINCH HOLLOW, LITTLE CHOCONUT & TROUT BROOK WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 2-B
LITTLE CHOCONUT CREEK
PLAN OF STORAGE AREA

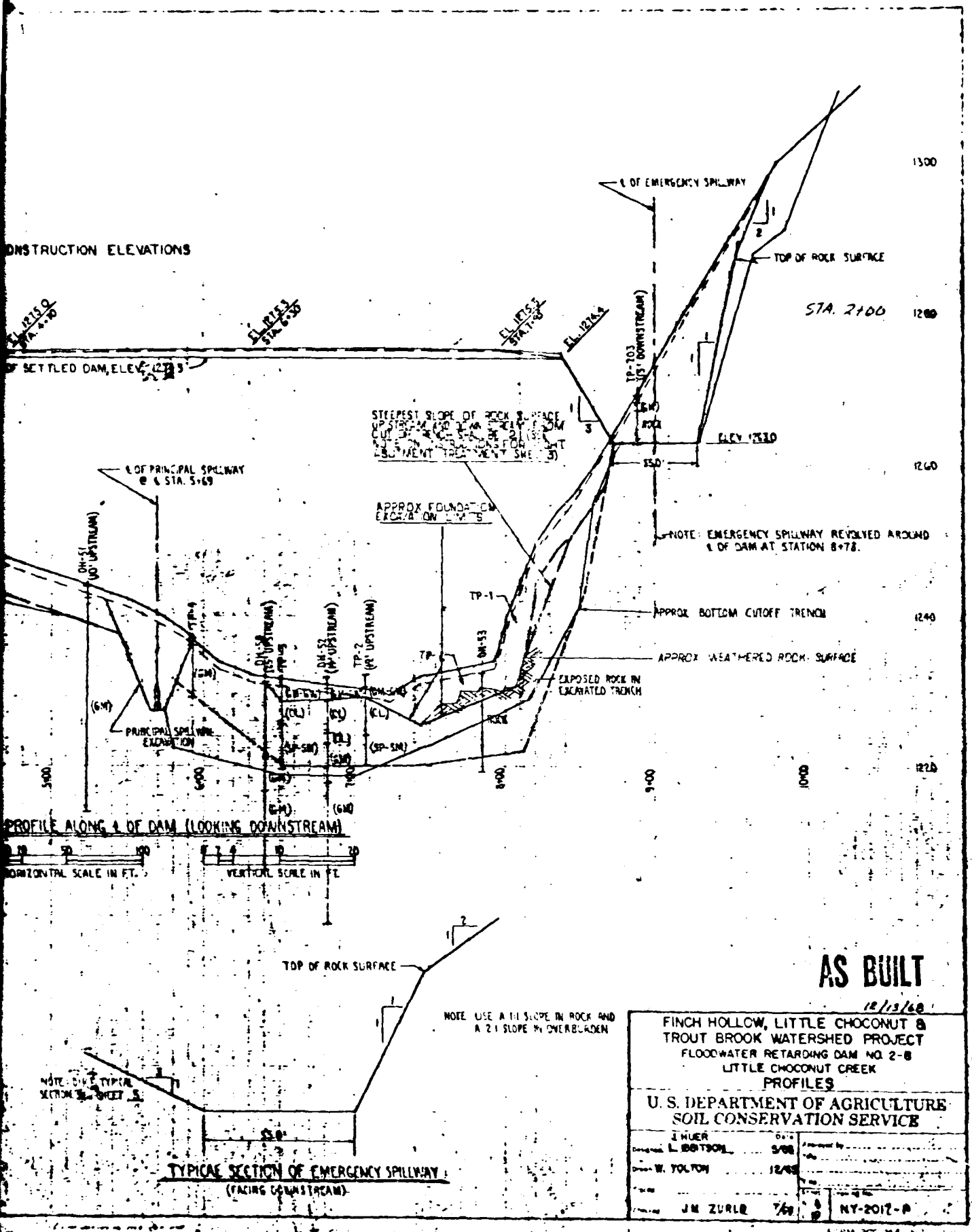
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

J HUER L C IBBITSON	5/68	
W YOLTON	6/69	
J M ZURLO	7/68	NY-2017-P


WOODS
SHED
HOUSE
HOUSE
AIRPORT ROAD
POWER POLE
POWER POLE
WOODEN POST
COAST ROAD
300'
BRUSH
RIPRAP
TYPICAL RIPRAP SECTION


LEGEND (FOR SHEETS 2 & 3)
- ℄ OF STREAM
- EXISTING FENCELINE
- BUILDINGS
- EDGE OF WOODS AND BRUSH
- TRAVERSE LINE STATIONS
- CONTOUR LINES
- DRILL HOLES
- SEDIMENT POOL
- DESIGN HIGH WATER
- CREST OF EMERGENCY SPILLWAY
- TEST PIT OR TRENCH (SAMPLED)
- TEST PIT OR TRENCH (LOGGED ON...
- CONSTRUCTION LIMIT
- BENCH MARK
INSTRUCTIONS FOR RIGHT ABUTMENT TREATMENT
REMOVE OVER BURDEN AND DECOMPOSED ROCK FROM APPROX ℄ DAM STA 7+50 TO B+67 AND FROM FOUNDATION DRAIN TO UPSTREAM LIMITS OF DAM (SEE SHEET 2). SHAPE REMAINING ROCK SURFACE TO SLOPES NO STEEPER THAN 2 HORIZONTAL TO 1 VERTICAL. REMOVE ALL ROCK BENCHES AND OVERHANGS TO PROVIDE A SMOOTH, CLEAN SURFACE FOR PLACEMENT OF COMPACTED FILL.
RIPRAP NOTES
AS BUILT
10/12/68
FINCH HOLLOW, LITTLE CHOCONUT & TROUT BROOK WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 2-B
LITTLE CHOCONUT CREEK
PLAN OF STRUCTURAL WORKS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
J HUER
L C ABBITSON 5/66
W YOLTON 12/65
JM ZURLO 7/67
NY-2017-P


CONSTRUCTION ELEVATIONS
1300
1280
1260
1240
1220
El. 1274.5
El. 1274.5 STA. 1+50
El. 1274.5 STA. 3+00
El. 1275.0 STA. 4+10
TOP OF SETTLED DAM, ELEV. 1275.5
TP-4
ORIGINAL GROUND LINE
APPROXIMATE STRIPPED GROUND LINE
(6M)
TP-5 (20' UPSTREAM)
OH-51 (40' UPSTREAM)
APPROX. BOTTOM OF CUTOFF TRENCH. FINAL DEPTH TO BE DETERMINED IN THE FIELD AT THE TIME OF CONSTRUCTION BY THE ENGINEER
PRINCIPAL SPILLWAY ELEVATION
0+00
1+00
2+00
3+00
4+00
5+00
PROFILE ALONG ℄ OF DAM
0 10 50 100
HORIZONTAL SCALE IN FT.
FROM APPROX ℄ STA. 0+80 TO 3+45 - B=12'
FROM APPROX ℄ STA. 5+80 TO 8+72 - B=14'
B
TYPICAL SECTION OF CUTOFF TRENCH



AS BUILT

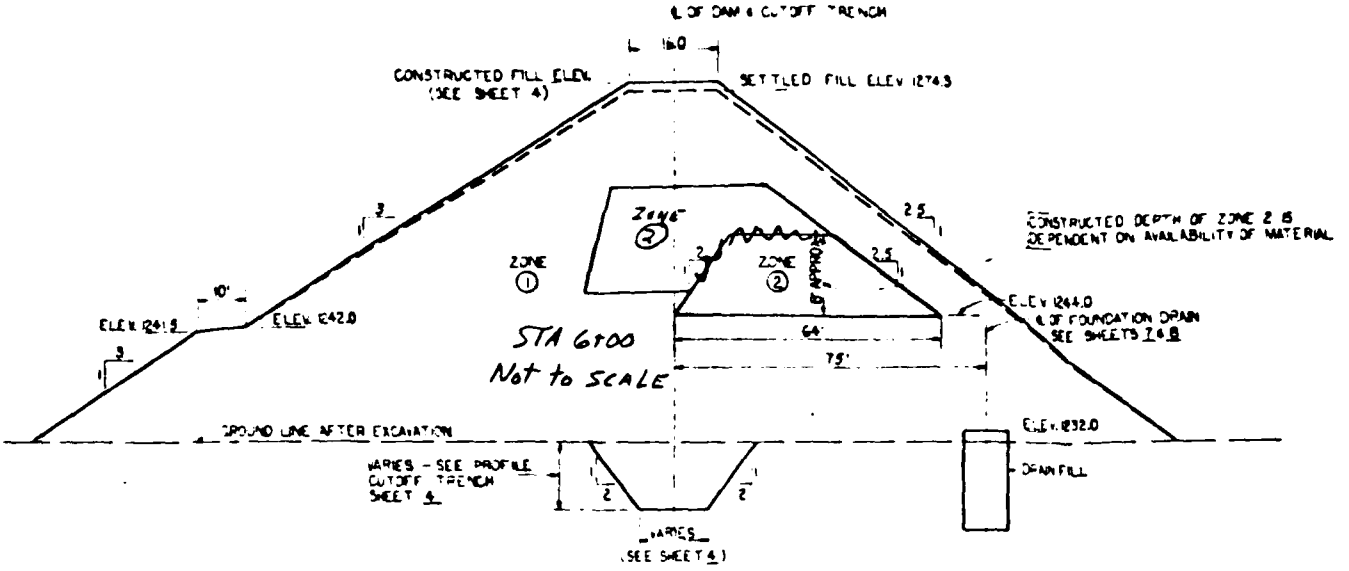
12/13/68

FINCH HOLLOW, LITTLE CHOCONUT & TROUT BROOK WATERSHED PROJECT
FLOODWATER RETARDING DAM NO. 2-B
LITTLE CHOCONUT CREEK
PROFILES

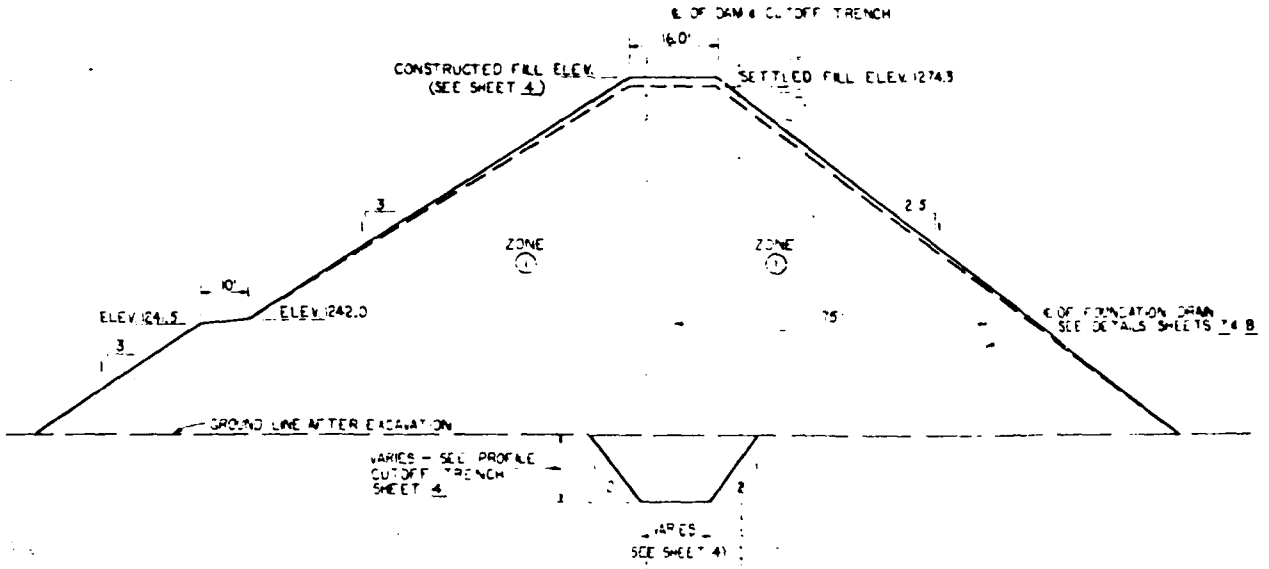
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

J HUER
L. BERTSON 5/68
W. TOLTON 12/68
JM ZURLO 7/68

NY-2017-B



SECTION OF DAM AT STA. 6+50 (TYPICAL FROM APPROX. STA. 3+70 TO 8+30)



SECTION OF DAM AT STA. 6+50 (TYPICAL FROM APPROX. STA. 0+76 TO 3+70 & STA. 8+30 TO 8+70)

ZONE	MATERIAL	FILL REQUIREMENTS MAX. ROCK SIZE	MAX. LIFT THICK. 1/	REQ'D WATER CONTENT 2/	COMPACTION 3/
①	SILTY GRAVEL OR REPRESENTED BY MATERIAL IN TEST PIT 103 FROM 2' TO 10'	6"	9"	2 PERCENTAGE POINTS BELOW TO 2 PERCENTAGE POINTS ABOVE OPTIMUM	A MINIMUM OF 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY THE MOISTURE-DENSITY RELATIONSHIP FOR THIS SOIL (ASTM D698)
②	HIGHLY FRACTURED SHALE AND SILTSTONE REPRESENTED BY MATERIAL IN DH 252 FROM 4.4 TO 4.8' AND DH 253 FROM 4.7' TO 7.9'	9"	18"	4	5
③	HARD SILTSTONE AND SANDSTONE REPRESENTED BY MATERIAL IN DH 252 FROM 4.8' TO 22.0' AND DH 253 FROM 7.9' TO 16.0'	24"	36"	NATURAL	4

1/ MAXIMUM LIFT THICKNESS PRIOR TO COMPACTION
2. WATER CONTENT AT TIME OF PLACEMENT
3. SEE TYPICAL COMPACTION CURVE ON SHEET 9
4/ THE MOISTURE CONTENT OF THE FILL MATERIAL SHALL BE MAINTAINED WITHIN THE LIMITS REQUIRED TO: (1) PREVENT THE ADHERENCE OF THE FILL MATERIAL TO THE TREADS AND LUGS OF THE EQUIPMENT, AND (2) ENSURE THE BREAKING OF THE SHALE PARTICLES INTO A REASONABLY HOMOGENEOUS MASS
5/ COMPACT BY A MINIMUM OF SIX (6) PASSES OF A SHEEPSFOOT ROLLER EXERTING A MINIMUM CONTACT PRESSURE OF 450 POUNDS PER SQUARE INCH MOVING AT A SPEED NOT TO EXCEED [illegible] M.P.H.

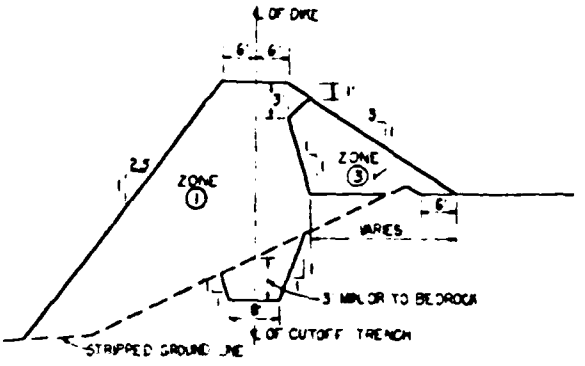
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

CONSTRUCTED DEPTH OF ZONE 2 IS DEPENDENT ON AVAILABILITY OF MATERIAL

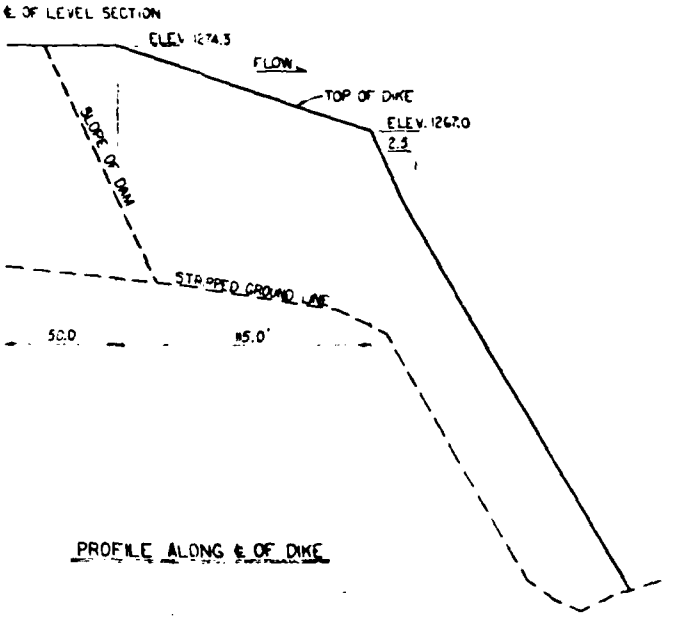
ELEV. 1244.0
℄ OF FOUNDATION DRAIN
SEE SHEETS 7 & 8

ELEV. 1232.0

DRAIN FILL



SECTION OF DIKE AT APPROX. CENTERLINE EMERGENCY SPILLWAY STATION 2+50. TYPICAL FROM APPROX STATION 1+90 TO 3+40 SEE SHEETS 3 AND 5



℄ OF FOUNDATION DRAIN
SEE DETAILS SHEETS 7 & 8

>30 TO 8+70)

PROFILE ALONG ℄ OF DIKE

AS BUILT

12/13/68

FINCH HOLLOW, LITTLE CHOCONUT & TROUT BROOK WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 2-B
LITTLE CHOCONUT CREEK
FILL PLACEMENT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

L C BRITSON 1/67
D ANGELO 1/67

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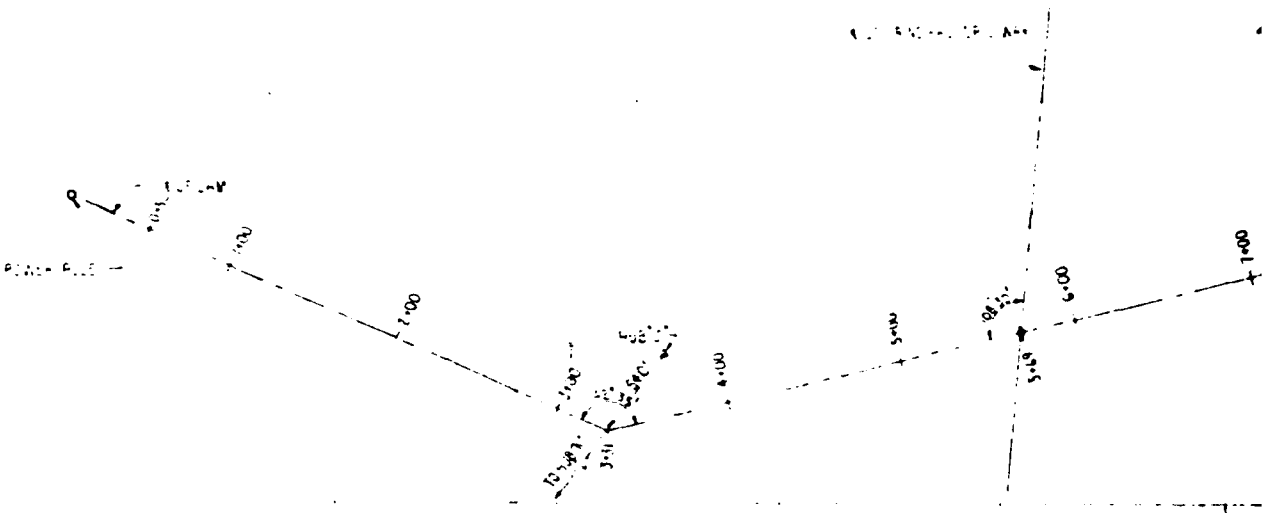
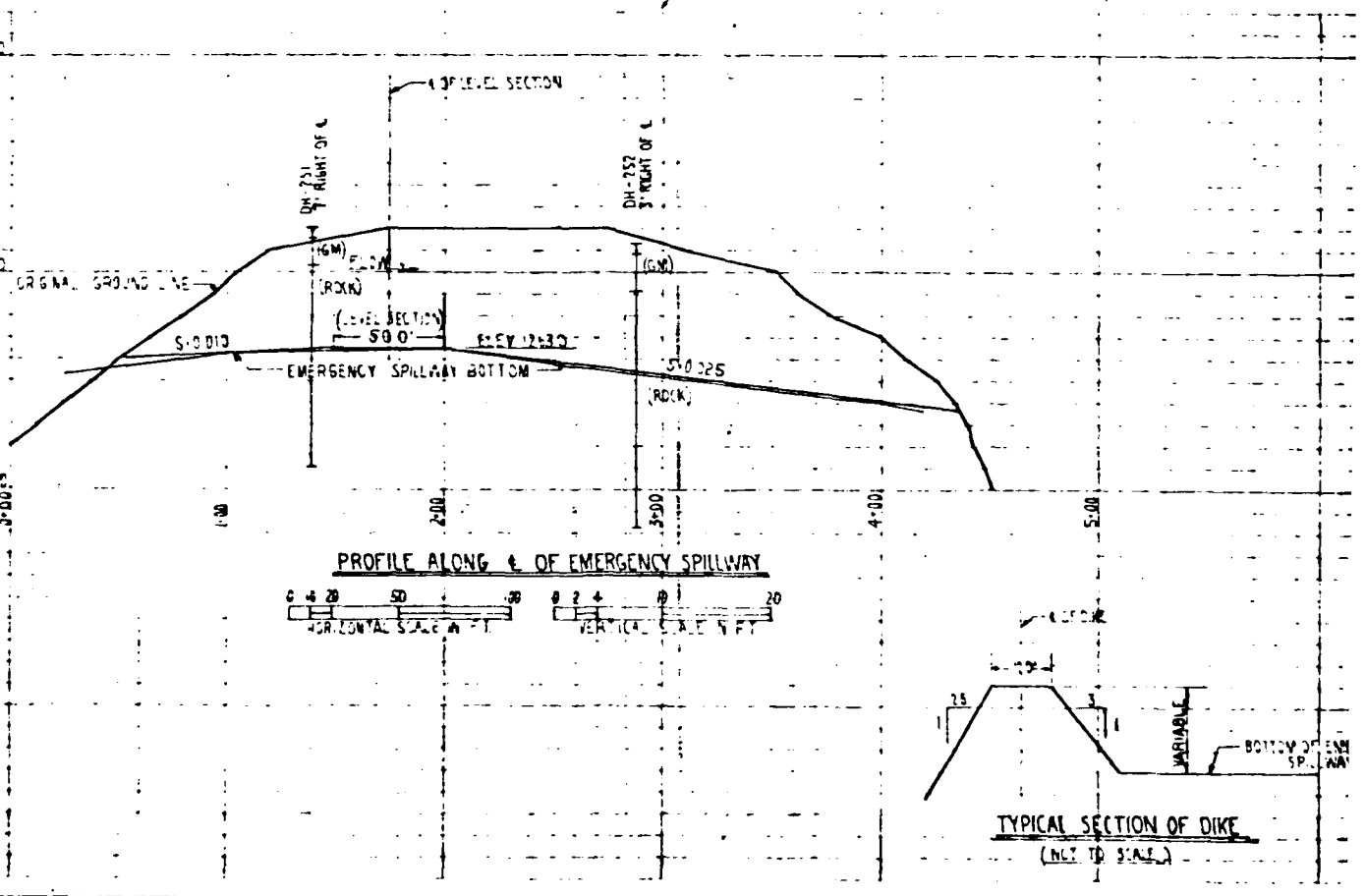
19
NY-2017-P

DAM & CURVE DATA LAYOUT

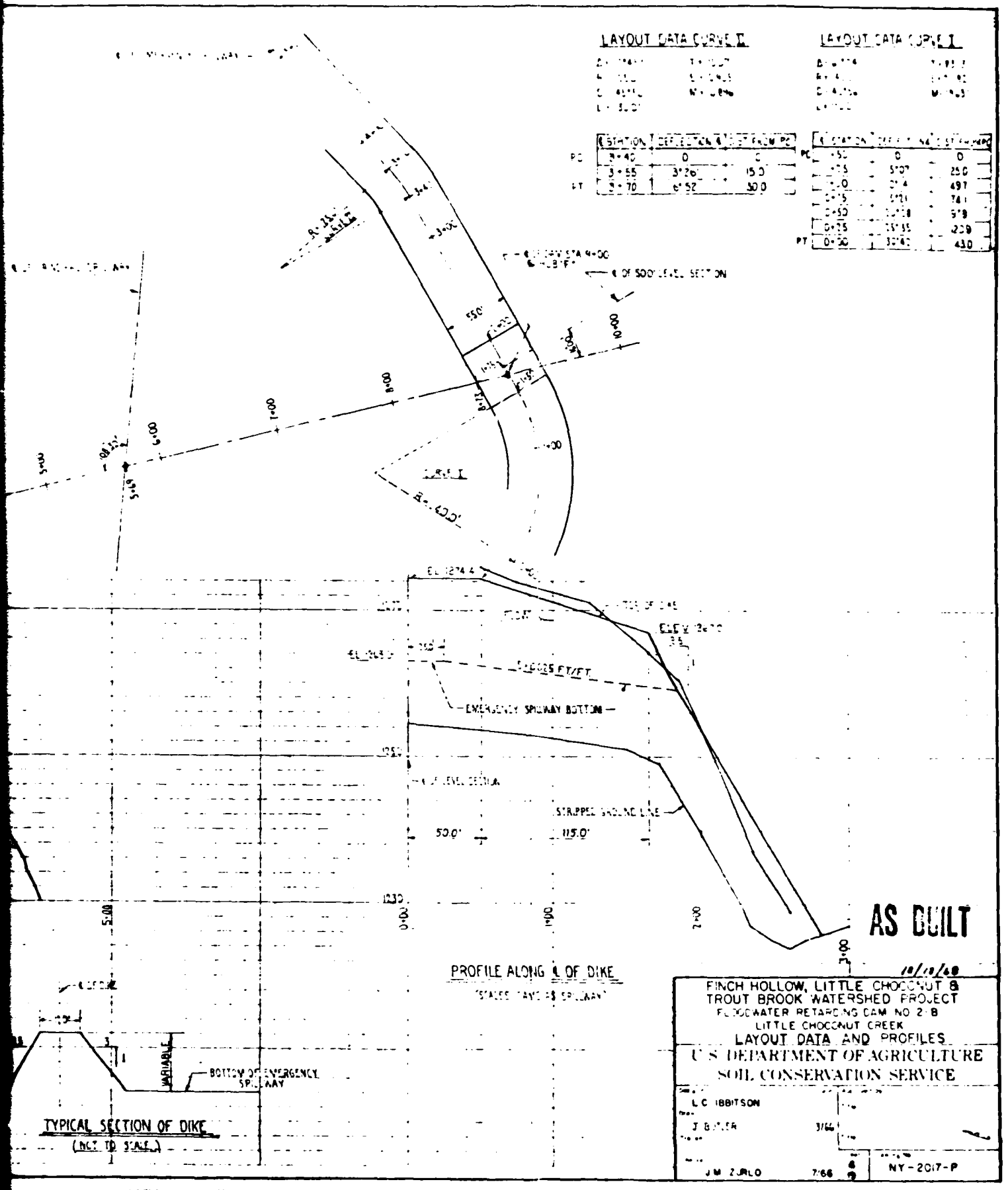


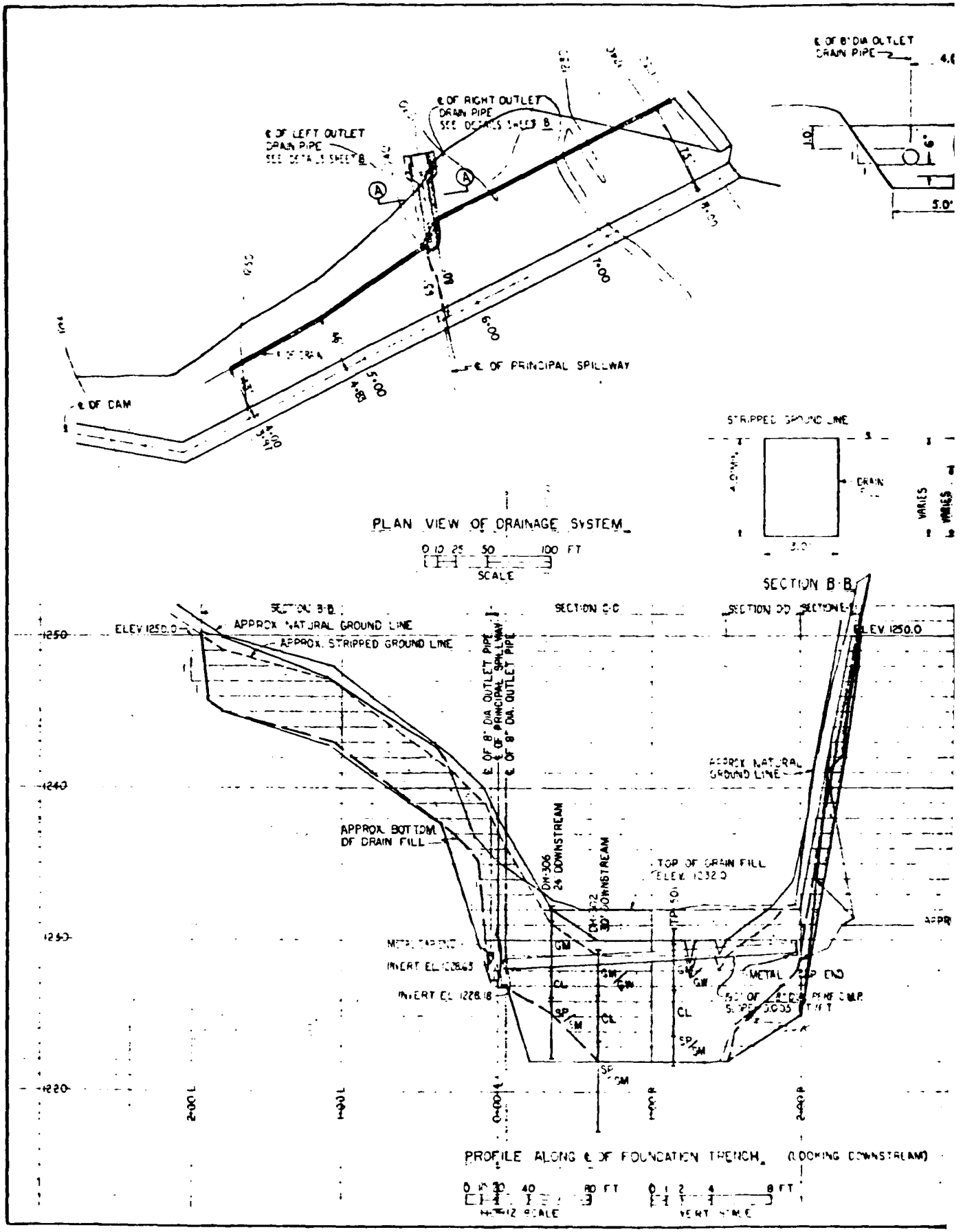


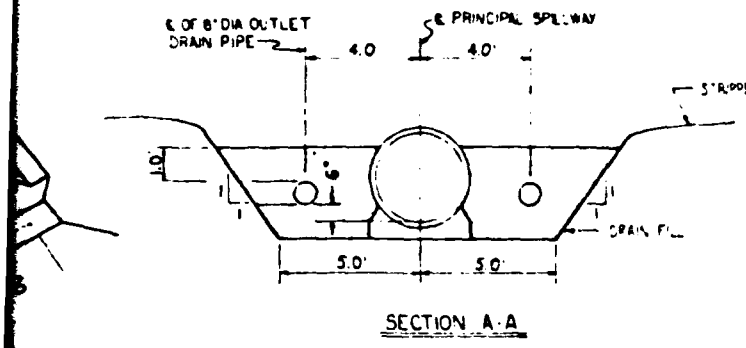
PROFILE ALONG ℄ OF EMERGENCY SPILLWAY

TYPICAL SECTION OF DIKE

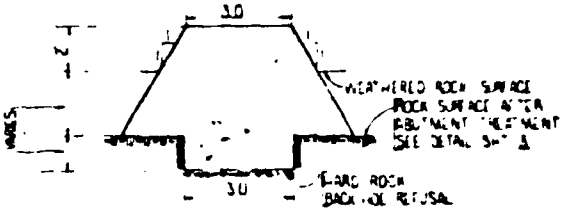
(NOT TO SCALE)


LAYOUT DATA CURVE II
LAYOUT DATA CURVE I
STATION
DEFLECTION
DIST FROM PC
PC
PT
9+40
0
0
9+55
3°26'
15.0
9+70
6°52'
30.0
EMERGENCY SPILLWAY BOTTOM
STRIPPED SHOULDER LINE
50.0'
115.0'
PROFILE ALONG ℄ OF DIKE
TYPICAL SECTION OF DIKE
(NOT TO SCALE)
VARIABLE
AS BUILT
10/10/68
FINCH HOLLOW, LITTLE CHOCONUT &
TROUT BROOK WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 2-B
LITTLE CHOCONUT CREEK
LAYOUT DATA AND PROFILES
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
L C IBBITSON
J BUTLER
3/66
J M ZURLO
7/66
NY-2017-P


℄ OF RIGHT OUTLET DRAIN PIPE SEE DETAILS SHEET B
℄ OF LEFT OUTLET DRAIN PIPE SEE DETAILS SHEET B
℄ OF 8" DIA OUTLET DRAIN PIPE
℄ OF DAM
℄ OF PRINCIPAL SPILLWAY
STRIPPED GROUND LINE
DRAIN
PLAN VIEW OF DRAINAGE SYSTEM
0 10 25 50 100 FT
SCALE
SECTION B-B
SECTION C-C
SECTION DD
ELEV 1250.0
APPROX NATURAL GROUND LINE
APPROX. STRIPPED GROUND LINE
℄ OF 8" DIA OUTLET PIPE
℄ OF PRINCIPAL SPILLWAY
℄ OF 8" DIA. OUTLET PIPE
APPROX BOTTOM OF DRAIN FILL
TOP OF DRAIN FILL ELEV. 1232.0
INVERT EL 1228.18
METAL END
1250
1240
1230
1220
2+00 L
1+00 L
0+00
1+00 R
2+00 R
PROFILE ALONG ℄ OF FOUNDATION TRENCH (LOOKING DOWNSTREAM)
0 10 20 40 80 FT
HORIZ SCALE
0 1 2 4 8 FT
VERT SCALE



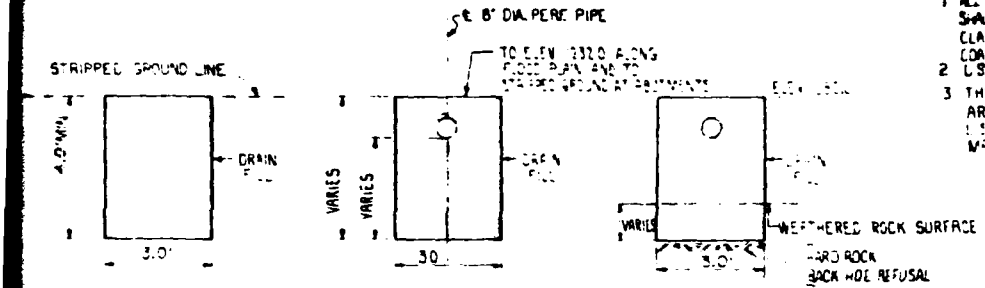
SECTION A-A



SECTION E-E

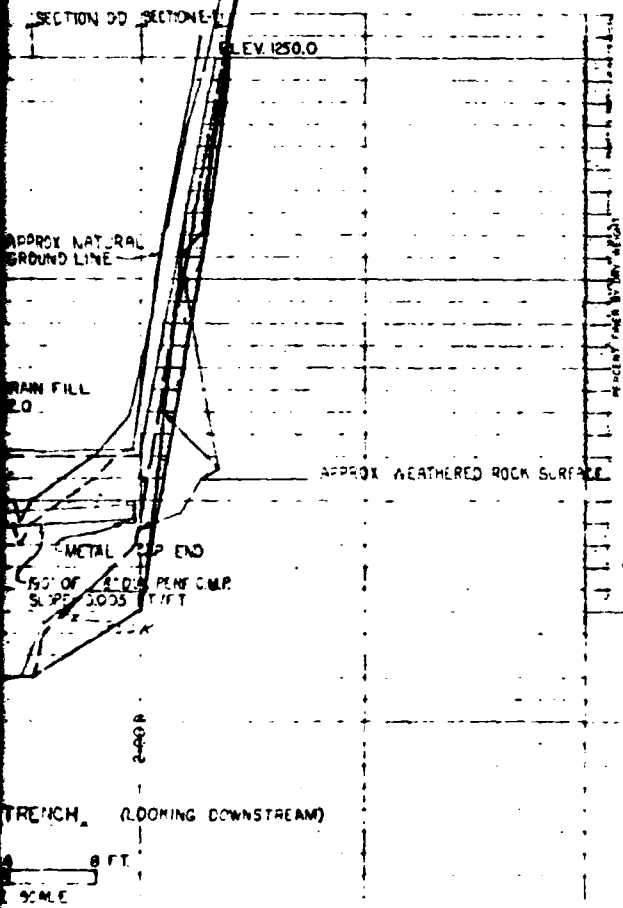
NOTES

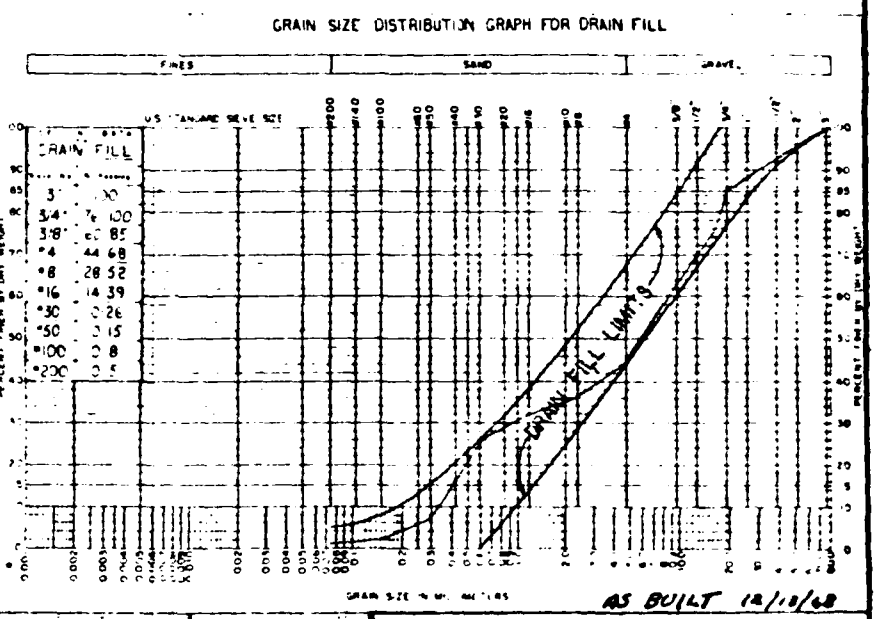
1 ALL DRAIN PIPE SHALL CONFORM TO SPECIFICATION 440 AND SHALL BE 8" DIA, SHAPE 1, CLASS 1 ANNULAR CORRUGATIONS OR CLASS II (HELICAL CORRUGATIONS), TYPE A FULLY BITUMINOUS COATED PERFORATED PIPE.
2 USE MINIMUM OF 2' DRAIN FILL AROUND PIPES
3 THE PROFILES OF THE BOTTOM OF ALL EXCAVATIONS AS SHOWN ARE APPROXIMATE. THE REQUIRED FINISHED GRADES WILL BE ESTABLISHED IN THE FIELD BY THE ENGINEER UPON INSPECTION OF THE MATERIAL ENCOUNTERED DURING EXCAVATION.



SECTION B-B SECTION C-C SECTION D-D

AS BUILT

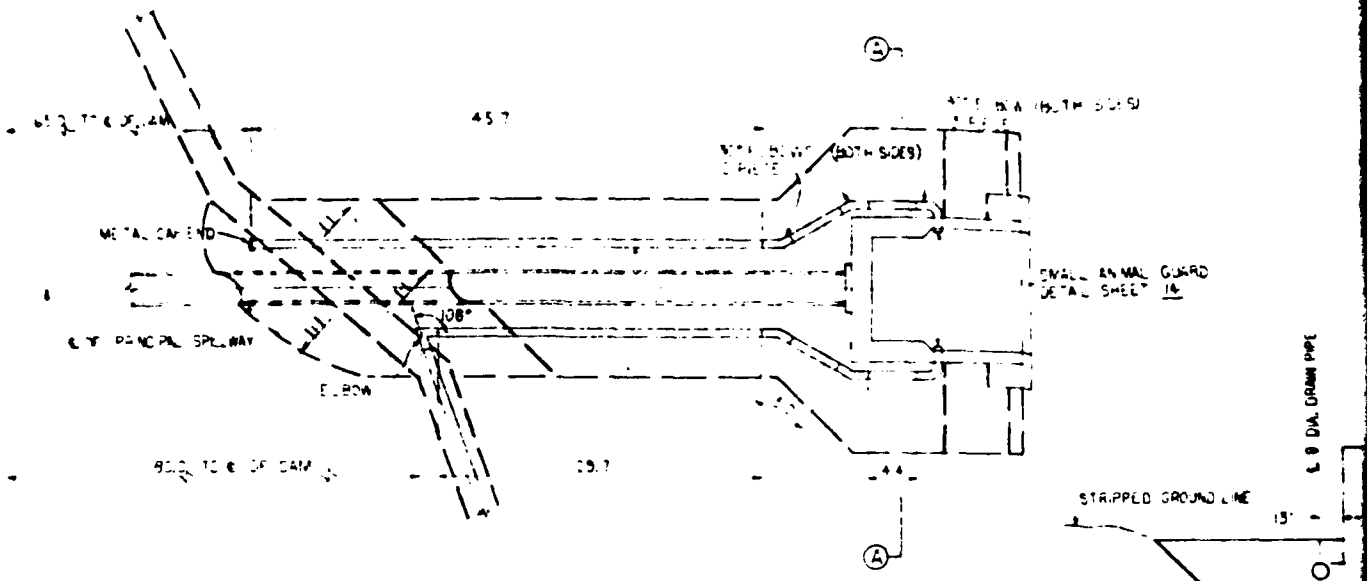




FINCH HOLLOW, LITTLE CHOCONUT & TROUT BROOK WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 2 B
LITTLE CHOCONUT CREEK
DRAINAGE SYSTEM DETAILS

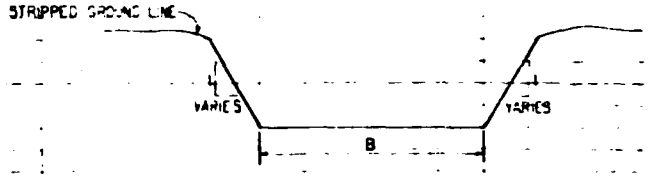
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

L. GIBBITSON	5/66	
D. ANGELO	5/66	
J.M. ZURLO	7/66	NY-2017-P

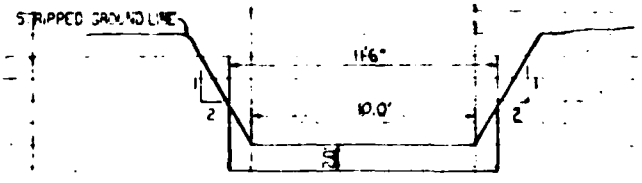


PLAN OF OUTLET DRAIN
(NOT TO SCALE)

STA. 2+10 TO 4+40 - 2:1 SS, B=10'
STA. 4+40 TO 4+87 - 1:1 SS, B=10'
STA. 4+87 TO 4+93 - TRANSITION
STA. 4+93 TO 5+10 - 1:1 SS, B=17.5'

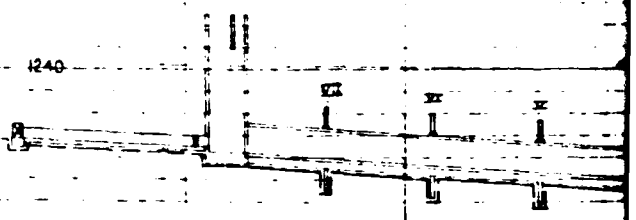


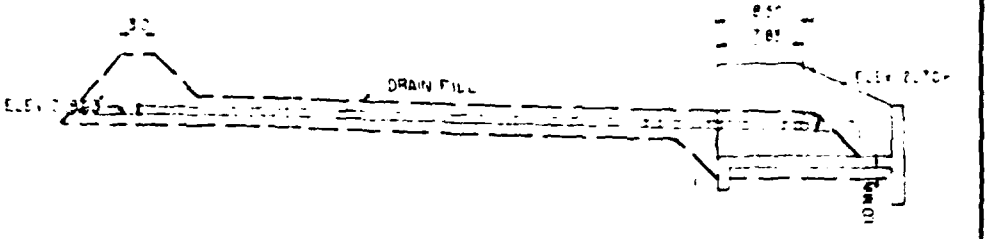
TYPICAL SECTION OF PRINCIPAL SPILLWAY EXCAVATION



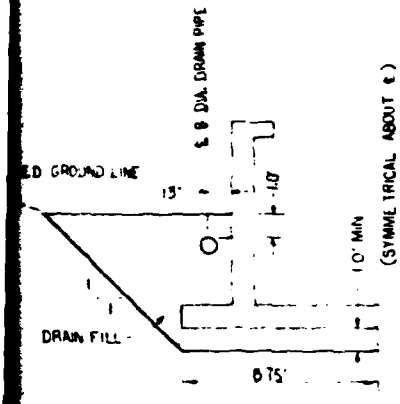
NOTE: EXCAVATE SLOTS 11'-6" x 2'

PRINCIPAL SPILLWAY EXCAVATION AT ANTI-SEEP COLLARS

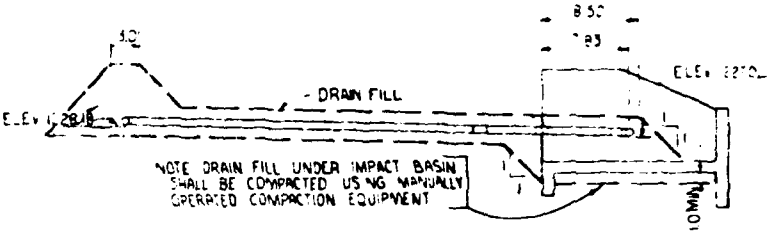




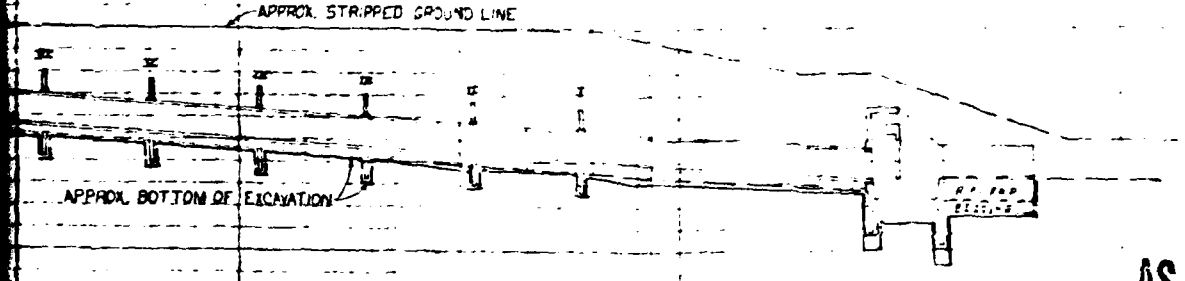
TYPICAL SECTION ALONG LEFT OUTLET DRAIN SEE SECTION A-A
(NOT TO SCALE)



SECTION A-A
(NOT TO SCALE)



TYPICAL SECTION ALONG RIGHT OUTLET DRAIN SEE SEC A-A
(NOT TO SCALE)



PROFILE ALONG ℄ OF POND DRAIN ℄ PRINCIPAL SPILLWAY

0 5 10 20 40 FT HORIZ. SCALE
0 2 4 8 16 FT VERT. SCALE

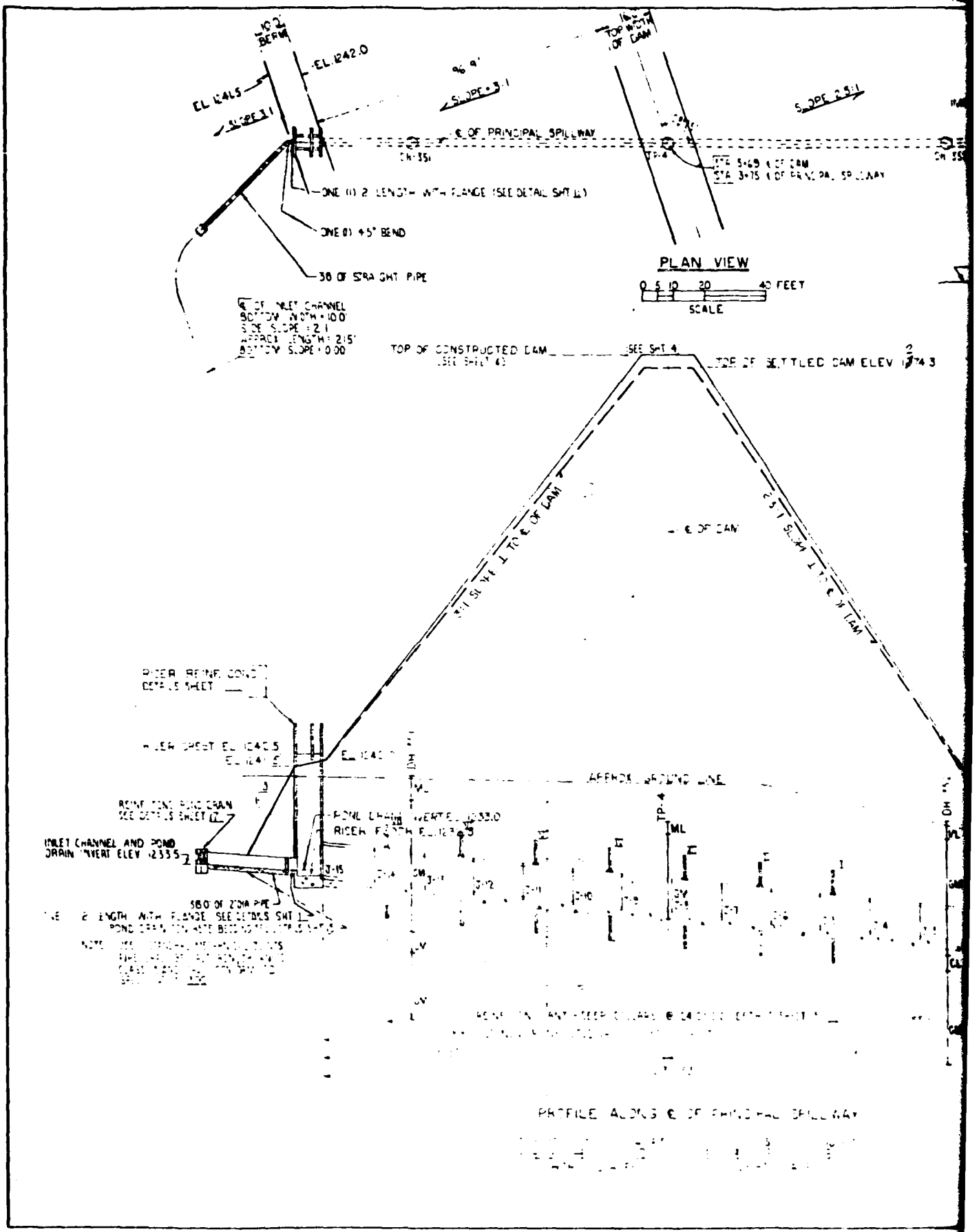
AS BUILT

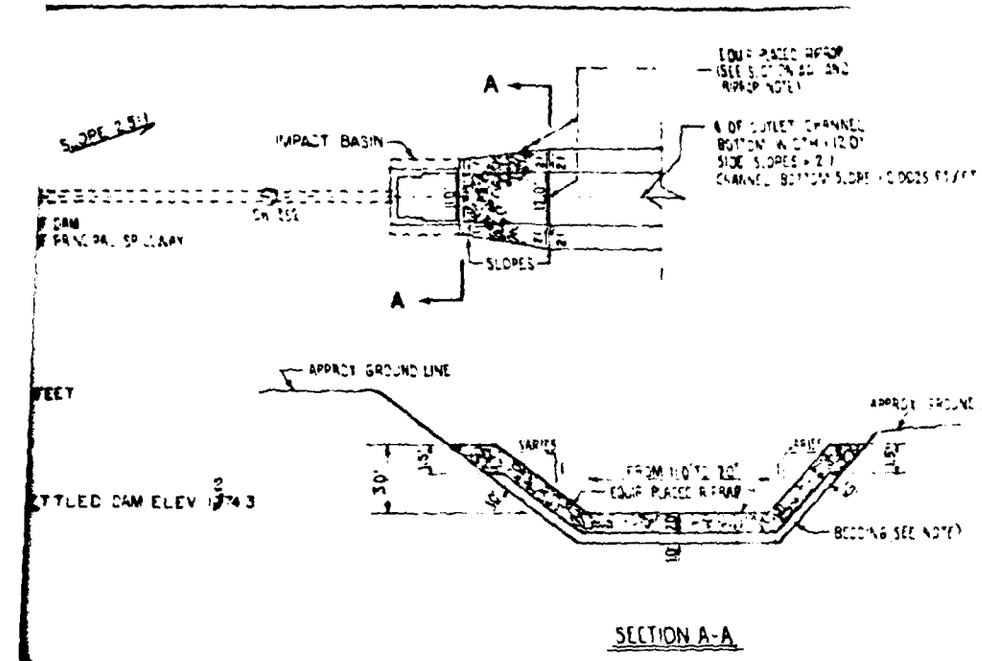
12/20/68

FINCH HOLLOW, LITTLE CHOCONUT & TROUT BROOK WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 2-B
LITTLE CHOCONUT CREEK
DRN'G SYSTEM OUTLET DETAILS & EXCAVATION SECTIONS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

L C IBBITSON	6/68		
D ANGELO	6/68		
J M ZURLO	7/68		NY-2017-P


EL 1245
SLOPE 3:1
EL 1242.0
℄ OF PRINCIPAL SPILLWAY
ONE (1) 2' LENGTH WITH FLANGE (SEE DETAIL SHT 4)
ONE (1) 45° BEND
30' OF STRAIGHT PIPE
TOP WIDTH OF DAM
SLOPE 2.5:1
PLAN VIEW
0 5 10 20 40 FEET
SCALE
TOP OF CONSTRUCTED DAM
SEE SHT 4
TOP OF SETTLED DAM ELEV 1243
℄ OF DAM
RISER BASE EL 1240.5
APPROX POND LINE
POND DRAIN INVERT EL 1233.0
INLET CHANNEL AND POND DRAIN INVERT ELEV 1235.5
30.0' OF 2'DIA PIPE
PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY



SECTION A-A

JOINT	DIST. FROM OUTLET	INVERT OF 30" DIA. PIPE	SLOPE
OUTLET	0	1226.50	
J-1	16	1226.34	
J-2	22	1226.28	
J-3	38	1226.12	
J-4	54	1225.96	
J-5	70	1225.80	
J-6	86	1225.64	
J-7	102	1225.48	
J-8	118	1225.32	
J-9	134	1225.16	
J-10	150	1225.00	
J-11	166	1224.84	
J-12	182	1224.68	
J-13	198	1224.52	
J-14	214	1224.36	
J-15	230	1224.20	

NOTE ABOVE DIMENSIONS FOR LENGTHS OF PIPE ARE BASED ON NOMINAL LENGTHS AND DO NOT INCLUDE CREEP.

COLLAR	DIST. FROM OUTLET	INVERT OF 30" DIA. PIPE
I	46.0	1228.42
II	90.0	1228.12
III	114.0	1229.81
IV	138.0	1230.51
V	162.0	1231.21
VI	186.0	1231.88
VII	210.0	1232.32

30" I.D. REINF. WATER PIPE
(10) 16.0' SECTIONS
1 6.2' SECTION
1 SPIGOT RING WALL FITTING FOR 10" WALL
TOTAL LENGTH = 231.2'
PRESSURE HEAD = 40.0'
LOAD: 4,208 LBS. PER LIN. FT. BASED ON O.D. OF 37"
MIN. 3 EDGE BEARING STRENGTH FOR 0.001" CRACK = 15,897 LBS. PER LIN. FT. FOR PRESTRESSED PIPE (AWWA C-301)

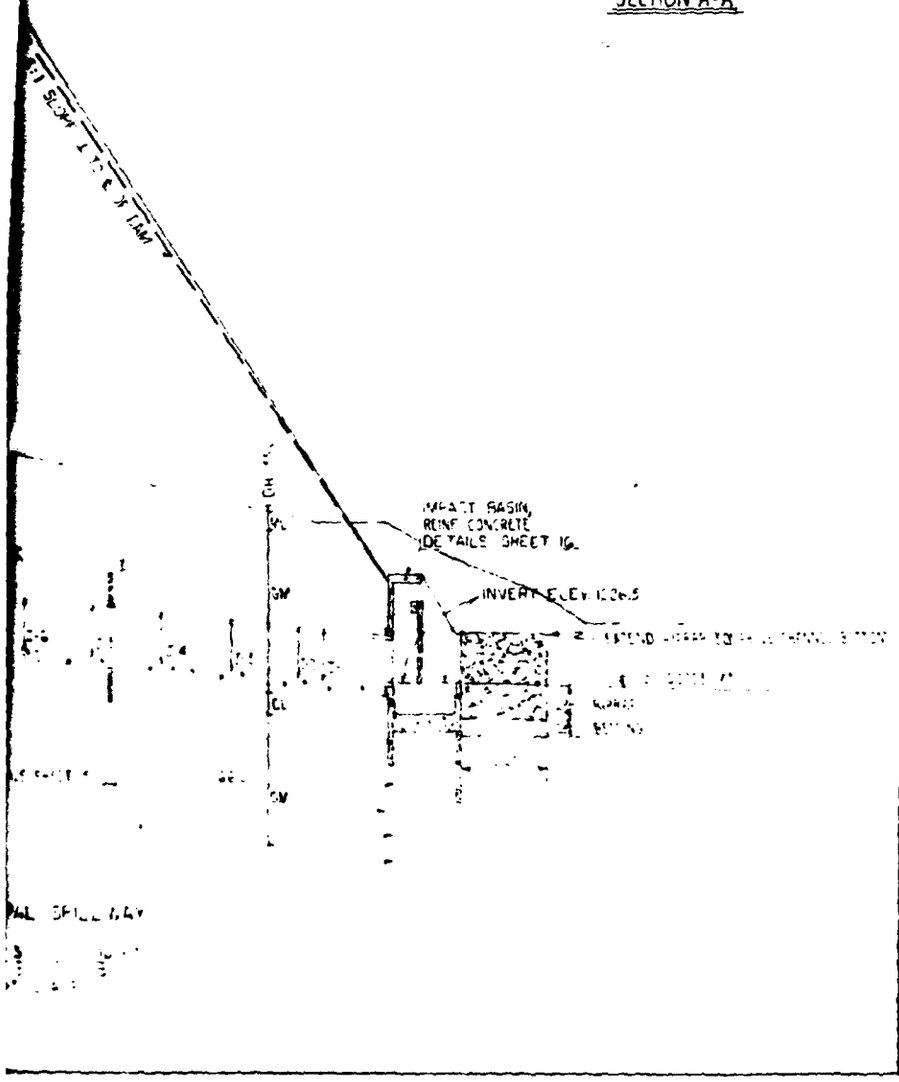
PIPE SUPPLIERS NOTE

CAST OUTSIDE OF SPIGOT RING WITH CONCRETE ON ONE 16.0' SECTION

RIPRAP NOTE

ALL RIPRAP SHALL BE GRADED FROM A MAX SIZE OF 18" TO A MIN. OF 3" AND SHALL BE LAID ON 12" OF BEDDING

BEDDING SHALL MEET THE GRADATION REQUIREMENTS FOR GRAVEL AS SHOWN ON SHEET I



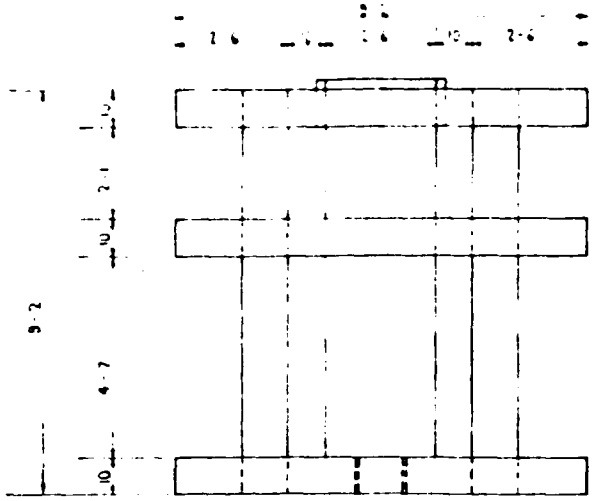
AS BUILT

10/15/68

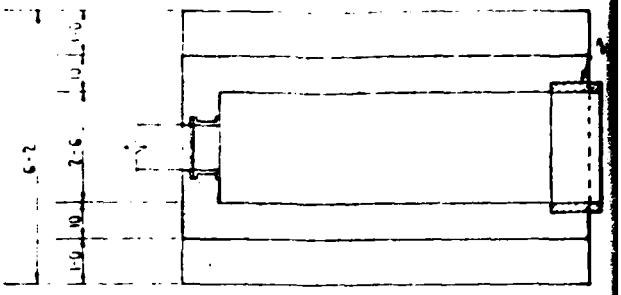
USE THIS SHEET FOR DIRECTIONS FOR INSTALLATION OF PIPE LINE

FINCH HOLLOW, LITTLE CHOCONUT & TROUT BROOK WATERSHED PROJECT
FLOOD WATER RETARDING DAM NO 2-B
LITTLE CHOCONUT CREEK
PLAN - PROFILE OF PRINCIPAL SPILLWAY
U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE

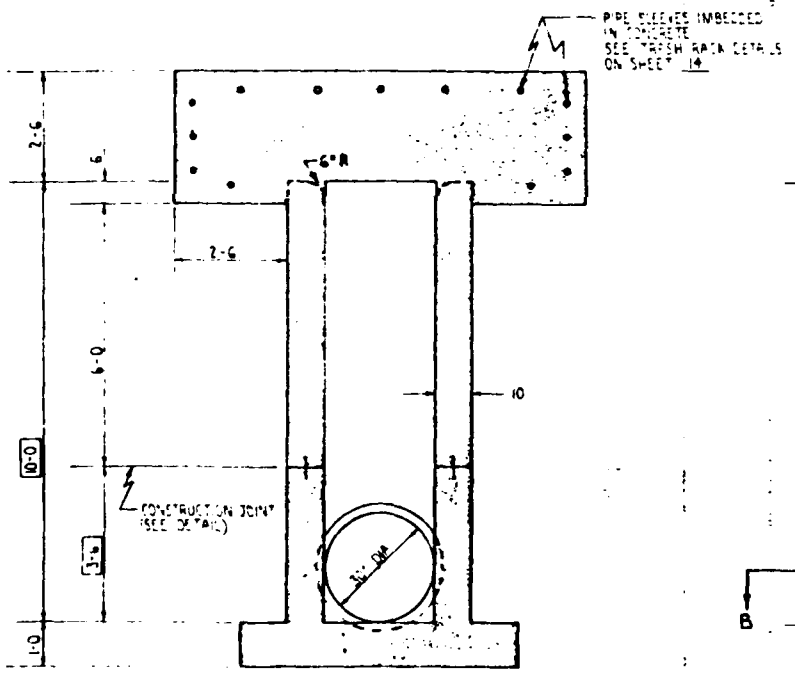
L.C. IBBITSON	5/66	
D. ANGELO	5.66	
J.M. ZURLO	7/66	9/9 NY-2017-P



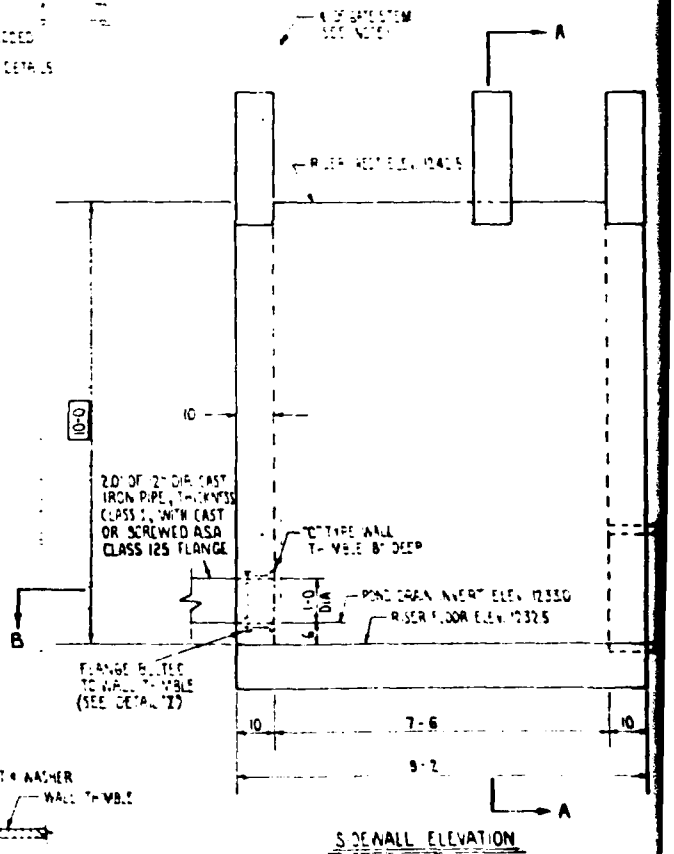
TOP PLAN



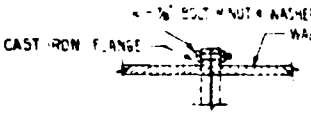
SECTION B-B



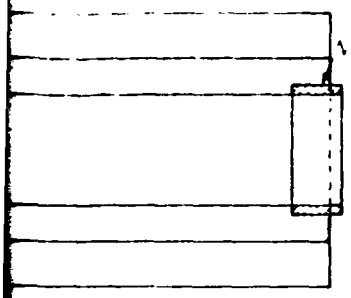
SECTION A-A



SIDEWALL ELEVATION

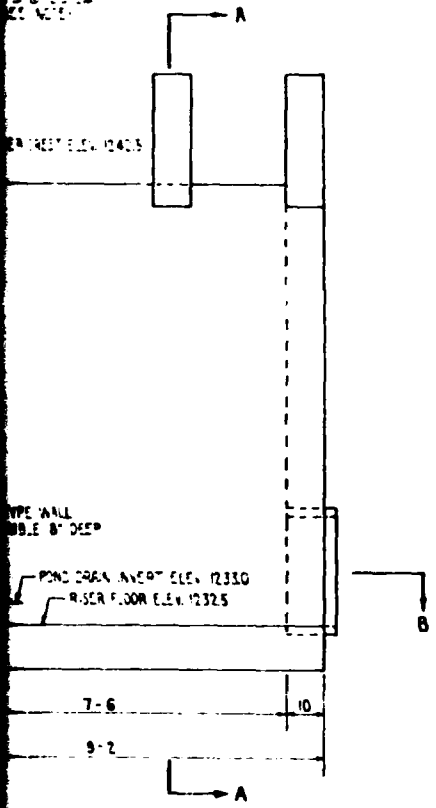


DETAIL "I"



RISER CONSTRUCTION JOINT DETAIL

SECTION B-B



SIDEWALL ELEVATION

SLIDE GATE NOTES

1. 12" DIA SLIDE GATE (SELF CONTAINED UNIT)
2. CLASS 0-30.
3. SLIDE GATE SHALL CONFORM TO SPECIFICATION 301 AND SHALL BE TYPE MHS-1.
4. 'C' TYPE WALL TO BE 8' DEEP.
5. STEM SHALL BE [illegible] AS SPECIFIED BY MANUFACTURER'S RECOMMENDATIONS. STEM SHALL BE PROVIDED WITH A REMOVABLE [illegible] WHICH THE HANDWHEEL SHALL BE LOCATED. A DRIVE THE [illegible] SLIDE AT A POINT ABOVE THE ELEVATION OF THE TOP OF THE [illegible] ALL OTHER STEM SUPPORTS SHALL BE LOCATED AT SPACING TO MEET MANUFACTURER'S RECOMMENDATIONS.
6. [illegible] IN ACCORDANCE WITH CONST SPEC [illegible]
7. [illegible] DRILLED IN FLANGE OF WALL THIMBLE BY MANUFACTURER TO BOLTING PATTERN AS SHOWN ON THE SLIDE GATE SPEC.

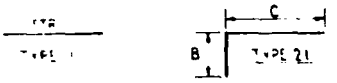
[illegible] CAST IRON CIRCLE
[illegible] BOLT HOLES
[illegible] BOLT HOLES

SCALE IN FEET

STEEL SCHEDULE

MARK	NO.	SIZE	LENGTH	TYPE	B	C	WEIGHT
B 1	5	10	5-9				1 [illegible]
B 2	5	9	5-9				1 [illegible]
B 3	5	18	8-9	21	3-0	5-9	5 [illegible]
B 4	5	6	8-9	1			5 [illegible]
B 5	5	2	8-3	1			2 [illegible]
B 6	5	9	5-9	1			5 [illegible]
B 7	5	2	6-3	1			4 [illegible]
B 8	5	5	6-9	21	1-0	5-9	33-9
B 9	5	17	6-9	21	1-0	5-9	4 9
B 10	5	8	8-3	1			44-0
B 11	5	4	3-3	1			1-0
B 12	5	3	7-3	1			9
B 13	5	1	2-3	1			9
B 14	5	8	5-9	21	0-6	5-3	4 0
B 15	5	12	8-0	21	2-9	5-3	96-0
R 1	5	20	6-1	1			2 8 ✓
R 2	5	4	8-3	1			5-6 ✓
R 3	5	12	3-3	1			39-0 ✓
R 4	5	20	6-3	1			78-0 ✓
R 5	5	36	8-0	21	2-9	5-3	198-0 ✓
T 1	5	28	4-4	1			2-4 ✓
T 2	4	12	3-9	2	2-6	1-3	41-0 ✓
T 3	4	36	2-7	1			93-0
T 4	4	4	2-1	1			8-4
T 5	4	18	8-9	1			157-6 ✓

BAR TYPES



RISER QUANTITIES

#4 BARS	303.83 LIN FT	203 LBS
#5 BARS	1409.00 LIN FT	1492 LBS
#7 BARS	157.50 LIN FT	322 LBS
TOTAL		3017 LBS

CONCRETE (REINFORCED) 42 CU YD

AS BUILT

12/13/68

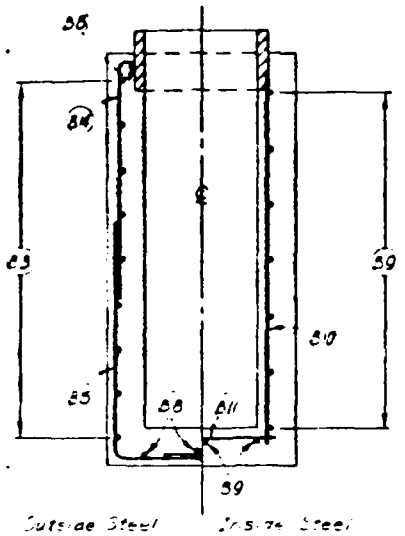
CONSTRUCTION DETAILS

1. SPECIFIED BAR DIMENSIONS ARE MEASURED TO THE OUTSIDE EDGE OF ALL BENDS.
2. RADIUS OF BENDS EQUALS 3 BAR DIAMETERS FOR SIZES EQUAL TO OR LESS THAN #7.
3. THE 2" & 3" DISTANCES FROM SPECIFIED CONCRETE SURFACES ARE CLEAR DISTANCES. WHERE NOT SPECIFIED, ALL REINFORCING STEEL PLACED IN CONCRETE POURED AGAINST THE GROUND SHALL HAVE A MINIMUM OF 3" CLEAR COVER. ALL REINFORCING STEEL PLACED IN CONCRETE POURED IN FORMS SHALL HAVE A MINIMUM OF 2" CLEAR COVER.
4. ALL EXPOSED EDGES OF CONCRETE TO HAVE A 3/4" CHAMFER UNLESS OTHERWISE NOTED.

FINCH HOLLOW, LITTLE CHOCONUT & TROUT BROOK WATERSHED PROJECT
FLOODWATER RETARDING DAM NO. 2-B
LITTLE CHOCONUT CREEK
RISER STRUCTURAL DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed D ZOGRAFOS	5/68	Approved	
Drawn W YOLTON	5/68	Title	
Traced		Title	
Checked J M ZURLO	7/68	Sheet No. 19	Drawing No. NY-2017-P

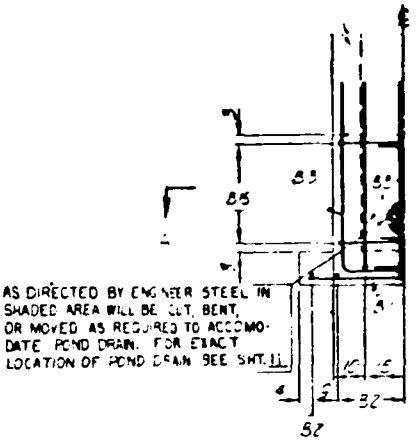


Outside Steel Inside Steel

SECTION A-A

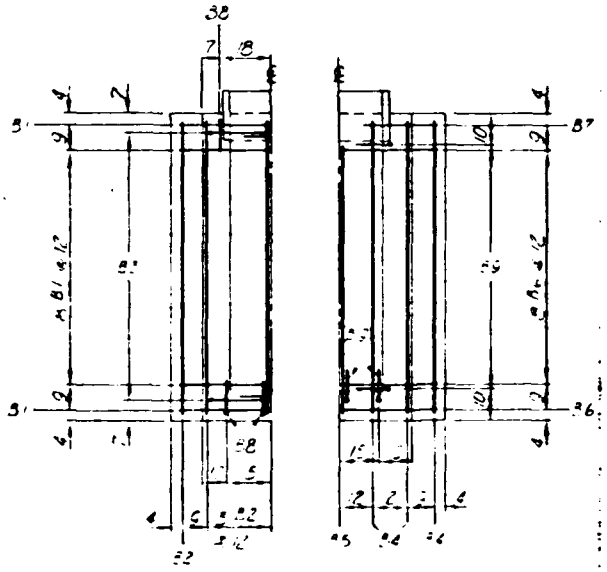
0 1 2 3

Scale in Feet

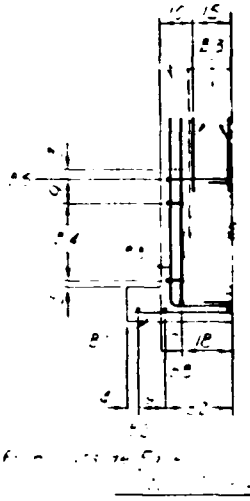


AS DIRECTED BY ENGINEER STEEL IN SHADED AREA WILL BE CUT, BENT, OR MOVED AS REQUIRED TO ACCOMODATE POND DRAIN. FOR EXACT LOCATION OF POND DRAIN SEE SHT. 11

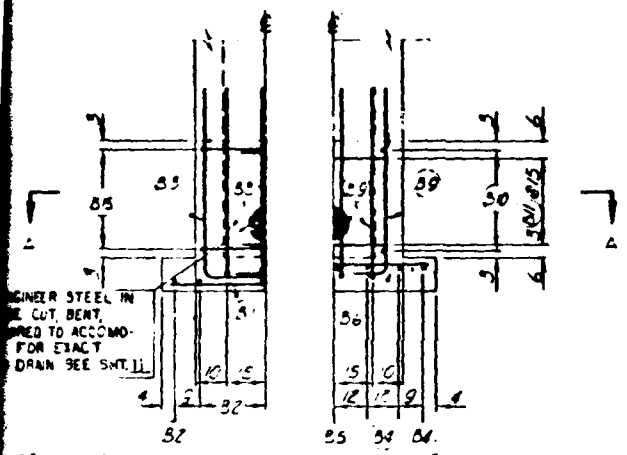
Steel 2" from Outside Face



Steel 9" From Bottom of Footing Steel 2" from Top of Footing

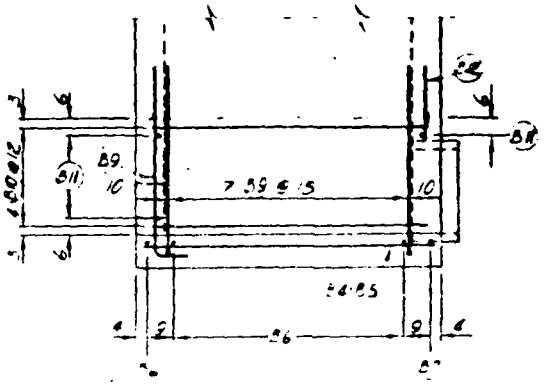


STANDARD COVERED RISER	
DESIGN CONSTANTS	f'_c [illegible] psi f_y 60,000 psi n 8 f_s 20,000 psi
STANDARD DWG NO	ES
DATE	[illegible]



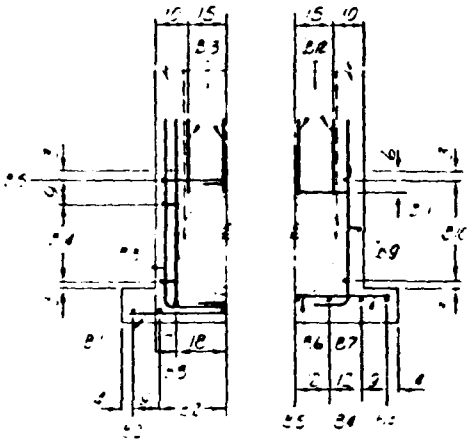
Steel 2" From Outside Face

Steel 2" From Inside Face

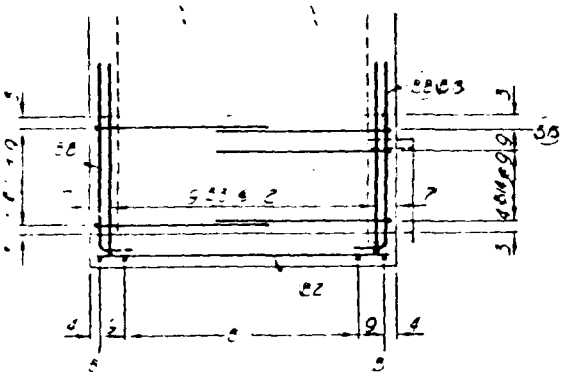


Steel 2" From Inside Face and 2" From Top of Footing

SIDEWALL ELEVATION



Steel 2" From Outside Face



Steel 2" From Outside Face and 4" From Bottom of Footing

AS BUILT

0 2 4

Scale in Feet

Unless Otherwise Shown 12/19/68

FINCH HOLLOW, LITTLE CHOCONUT & TROUT BROOK WATERSHED PROJECT

FLOODWATER RETARDING DAM NO. 2-B

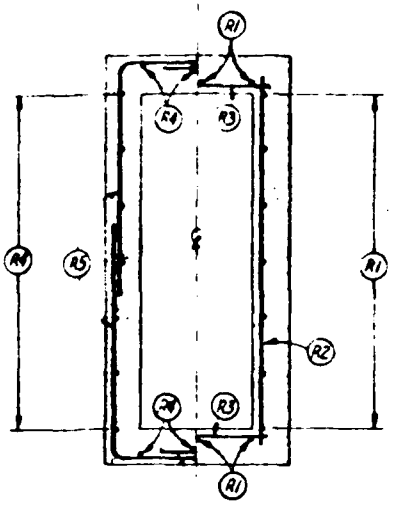
LITTLE CHOCONUT CREEK

RISER STRUCTURAL DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

D ZOGRAFOS

JM ZURLO 7/66 12/19 NY-2017-P

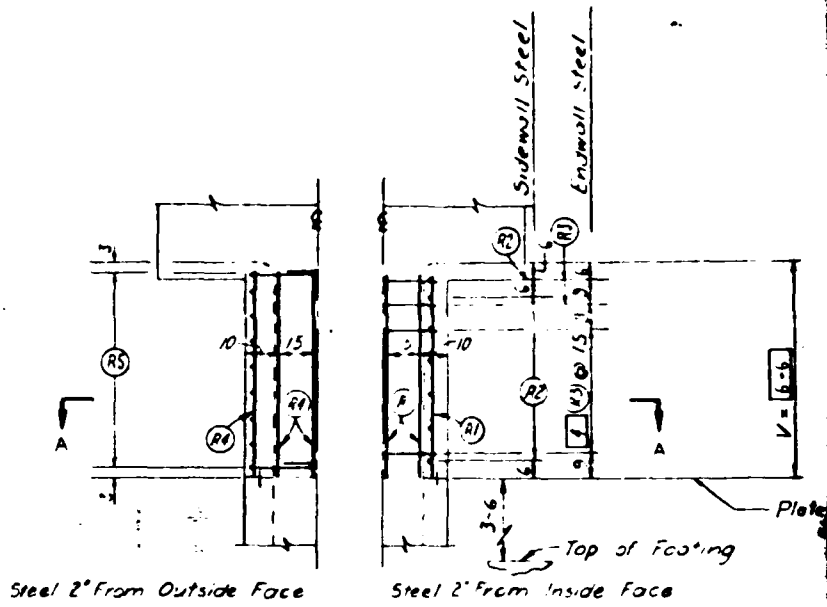


Outside Steel Inside Steel

SECTION A-A

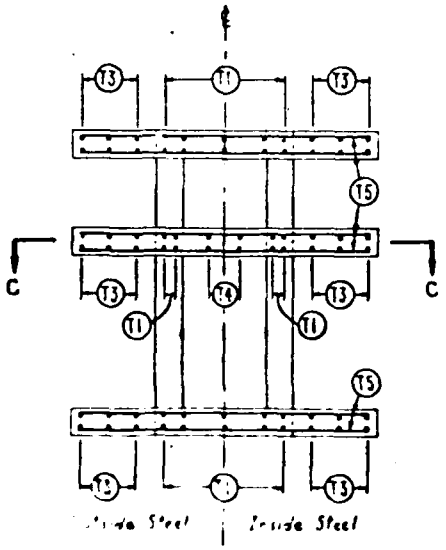
0 1 2 3

Scale in Feet



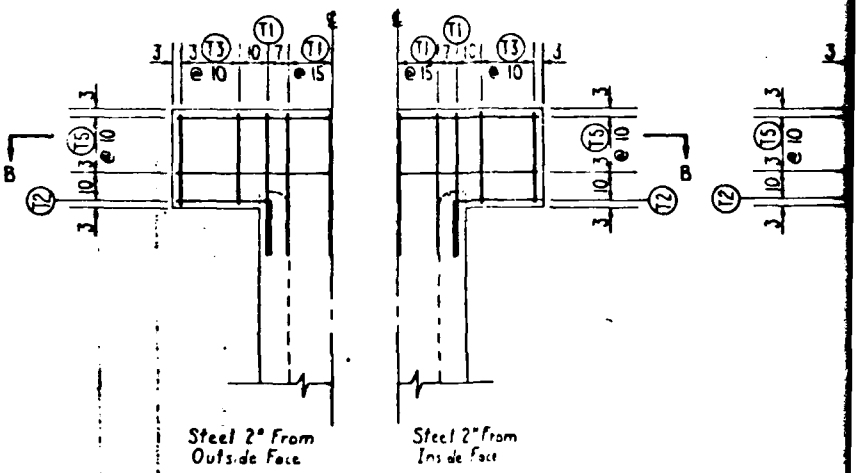
Steel 2" From Outside Face Steel 2" From Inside Face

ENDWALL ELEVATION



Outside Steel Inside Steel

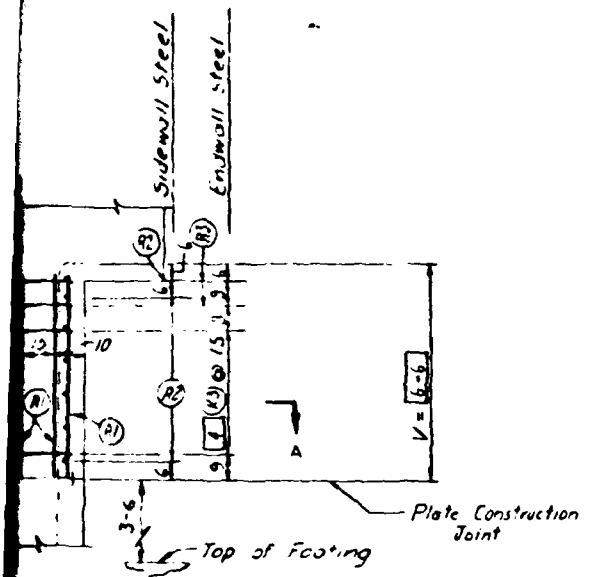
SECTION B-B

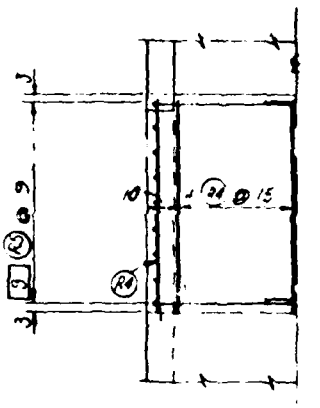


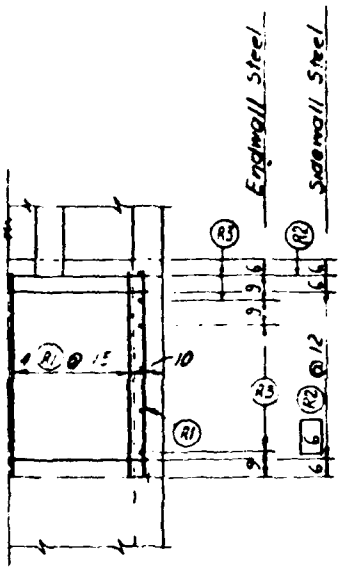
Steel 2" From Outside Face Steel 2" From Inside Face

UPSTREAM & DOWNSTREAM

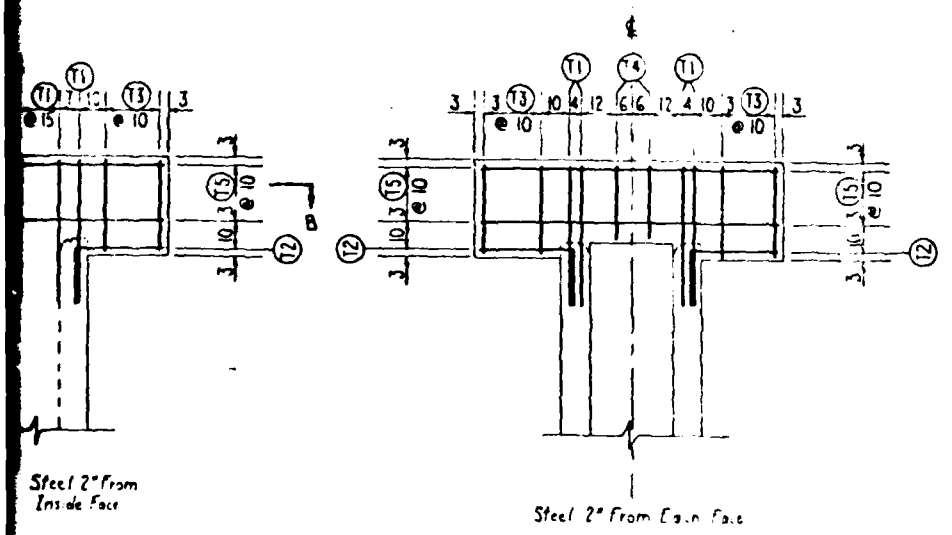
ANTI-VORTEX BAFFLE







SIDEWALL ELEVATION



UPSTREAM BAFFLE

CENTER ANTI-VORTEX BAFFLE SECTION C-C

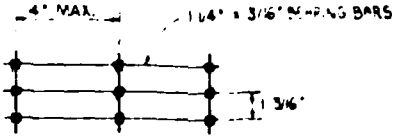
AS BUILT

0 2 4
Scale in Feet
Unless Otherwise Shown 12/13/68

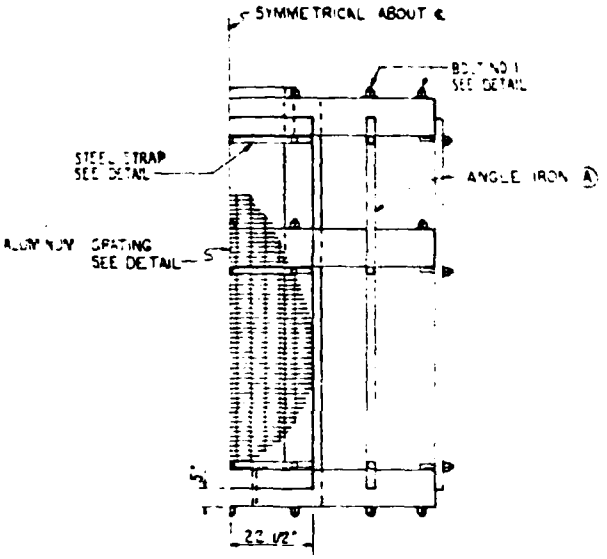
FINCH HOLLOW, LITTLE CHOCONUT & TROUT BROOK WATERSHED PROJECT
• FLOODWATER RETARDING DAM NO. 2-B
LITTLE CHOCONUT CREEK
RISER STRUCTURAL DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

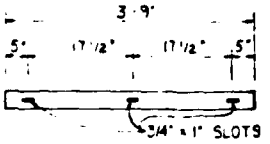
Designed D ZOGRAFOS	Date 5/66	Approved by	
Drawn W. YOLTON	5/66	Title	
Traced		Title	
Checked J.M. ZURLO		Sheet No. 13 of 19	Drawing No. NY-2017-P



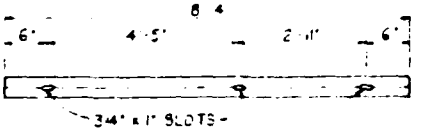
ALUMINUM GRATING DETAIL



PLAN

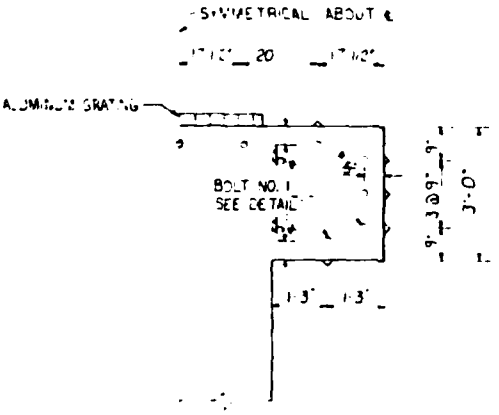


STEEL STRAP DETAIL

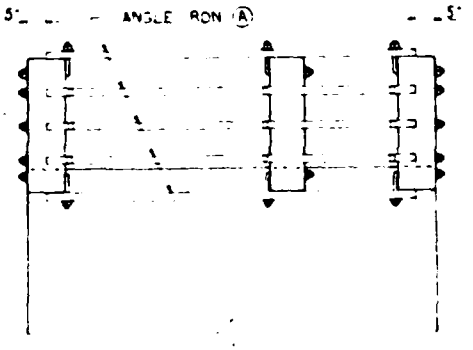


ANGLE IRON (A)

NOTE
ENTIRE TRASH RACK EXCEPT ALUMINUM GRATING TO BE GALVANIZED IN ACCORDANCE WITH SPEC. 9



UPSTREAM ELEVATION



SIDE ELEVATION

RISER TRASH RACK DETAILS

BILL OF MATERIALS

LOCATION	ITEM	SIZE	LENGTH	QUAN.
TRASH RACK	A ANGLE IRON	3"x3"x.38"	8'-4"	15
	BOLT NUT & WASHERS GALV	5/8" DIA	8'-1 3/8"	39
	GALV PIPE SLEEVE	3.4" O.D.	10"	39
	ALUMINUM GRATING		8'-4"x3'-9"	1
	STEEL STRAP	1/4"x2"	3'-9"	3

1 1/4" x 3/16" BEARING BARS

1 3/16"

DETAIL

9"

17 1/2" 5"

3/4" x 1" SLOTS

P DETAIL

4"

2'-11" 6"

IRON (A)

13"

3/8" DIA BOLT THREADED PORTION AT EACH END

3/4" DIA PIPE SLEEVE

NUT & WASHER

GRATING OR ANGLE IRON

NUT & WASHER

BOLT DETAIL N° 1

FIELD TO SUPPLY NUTS & WASHERS

(A) 5"

3/8" Dia Bolts w/ Hex Nut And Washers 9" Long

1 1/2"

Drill 1 1/2" Dia Holes

2" @ 3 1/2"

8" Dia Pipe

ELEVATION

SMALL ANIMAL GUARD DETAILS

AS BUILT

12/10/68

FINCH HOLLOW, LITTLE CHOCONUT & TROUT BROOK WATERSHED PROJECT

FLOODWATER RETARDING DAM NO 2-B

LITTLE CHOCONUT CREEK

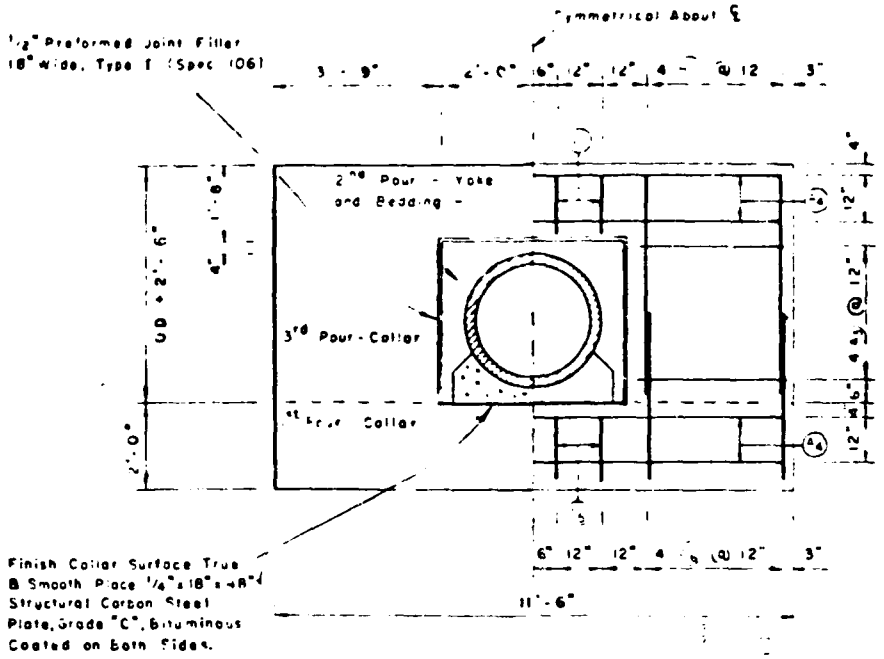
TRASH RACK & SMALL ANIMAL GUARD DETAILS

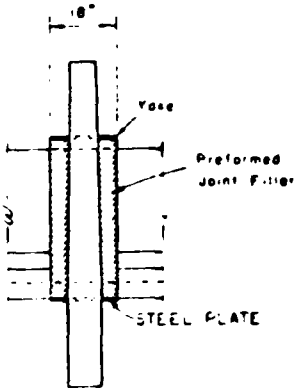
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

L BRITSON 5/66

D ANGELO 5/66

JMZ-P.C 5/66 16/16 NY-207-P



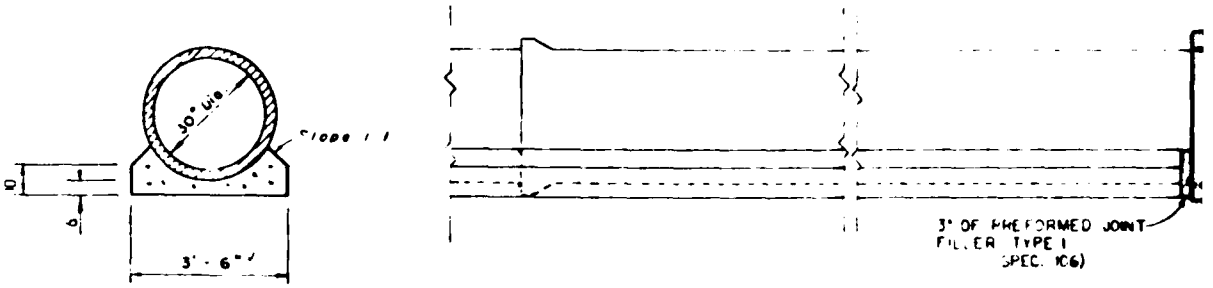


REINFORCED CONCRETE ANTI-SEEP COLLAR

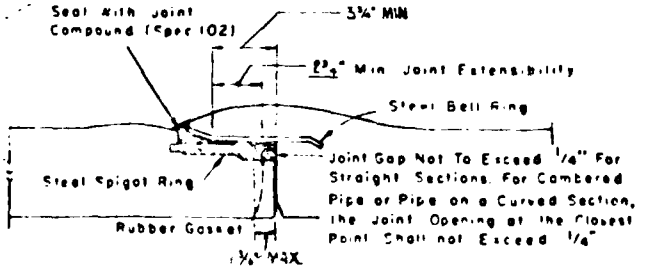
SCALE

7 - Req'd

IMPACT BASIN

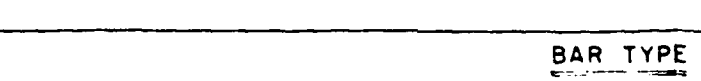


CONCRETE BEDDING



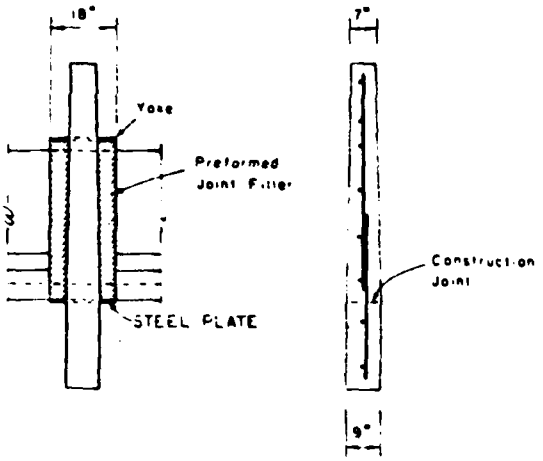
REINFORCED CONCRETE WATER PIPE JOINT

BAR TYPE



ANTI-SEEP COLLAR STEEL SCHEDULE

Mark	Size	Length	Type	Quan / Collar	Total Quan	Total Length
A-1	4	1-3	1	4	28	35-0
A-2	4	4-1	1	8	56	234-8
A-3	4	3-3	1	8	56	182-0
A-4	4	11-0	1	4	28	308-0
A-5	4	1-6	1	4	28	42-0
A-6	4	3-2	1	8	56	177-4



TOTAL COLLAR & BEDDING QUANTITIES

STEEL

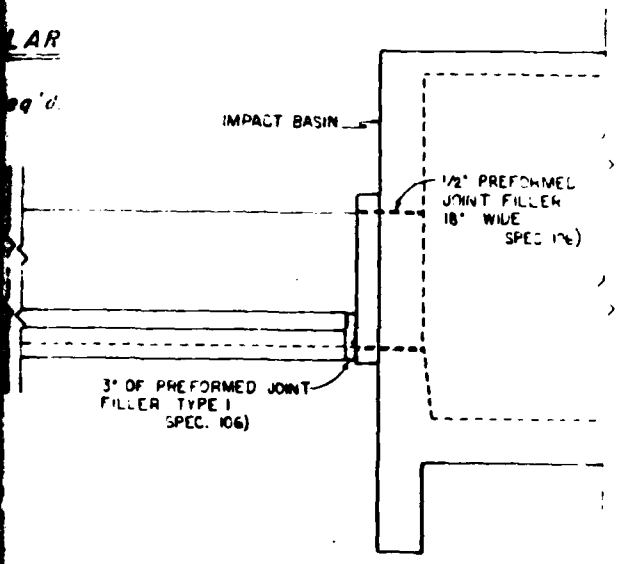
No 4 Bar 1019.67 Lin Ft 681.1 Lbs

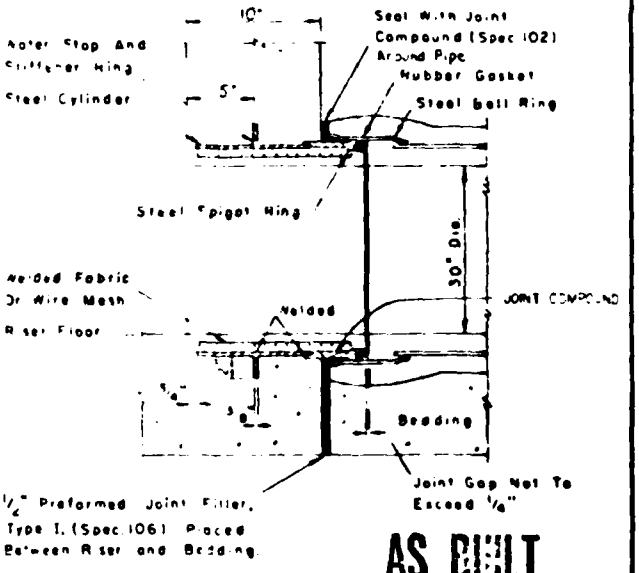
CONCRETE

REINFORCED 14.56 Cu Yds

NON-REINFORCED 23.44 Cu Yds

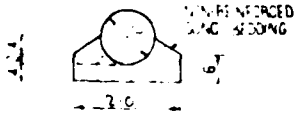
SEE SHEET 10 FOR CONSTRUCTION DETAILS





AS BUILT

SPIGOT RING WALL FITTING



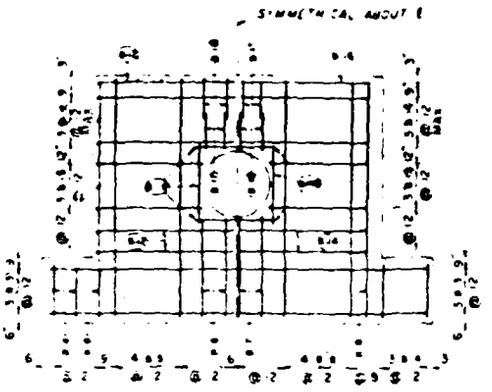
POND DRAIN CONCRETE BEDDING

12/13/68

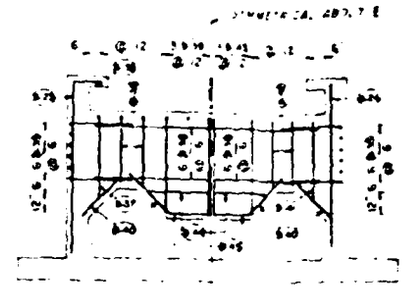
FINCH HOLLOW, LITTLE CHOCONUT & TROUT BROOK WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 2-B
LITTLE CHOCONUT CREEK
CONDUIT DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

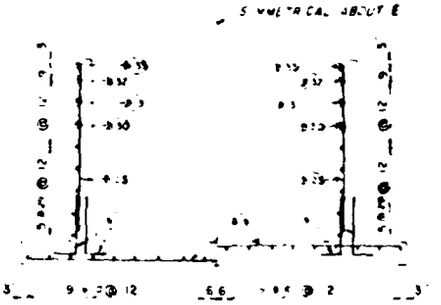
L C BEATSON — Date
Approved by ...
Title ...
Nov 68
Title ...
Scale 1in = 1ft
Drawing No NY-2017-P
J M ZURLO 7/68



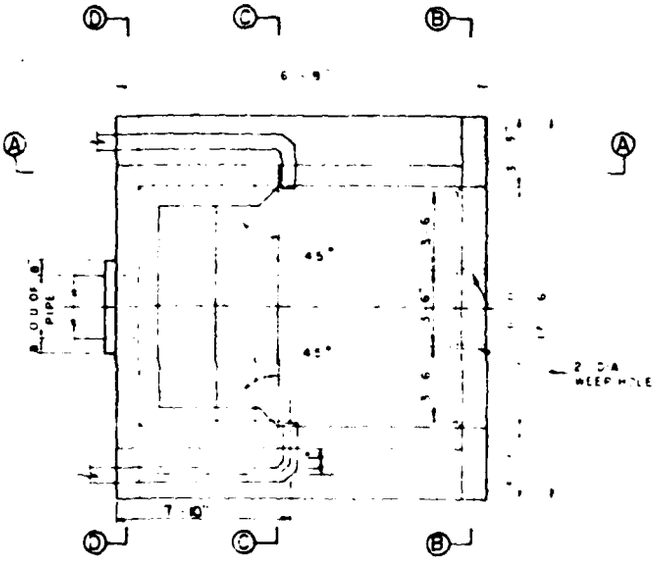
SECTION D-D



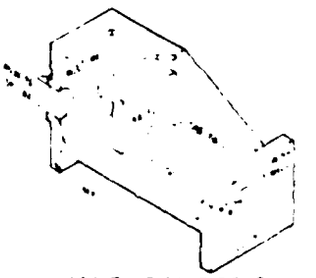
SECTION THRU BAFFLE



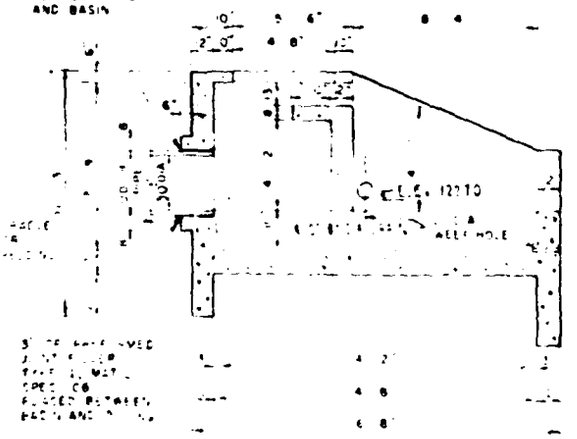
SECTION C-C



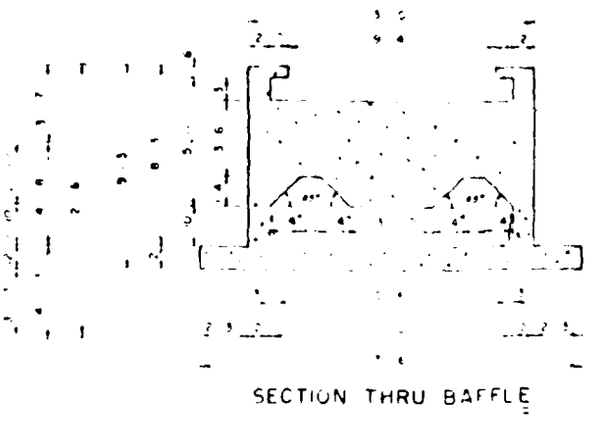
PLAN VIEW



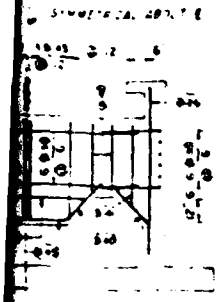
HALF ISOMETRIC



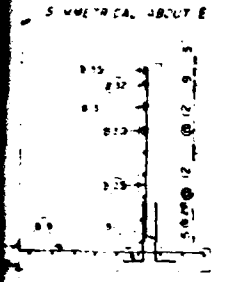
SECTION ON ℄



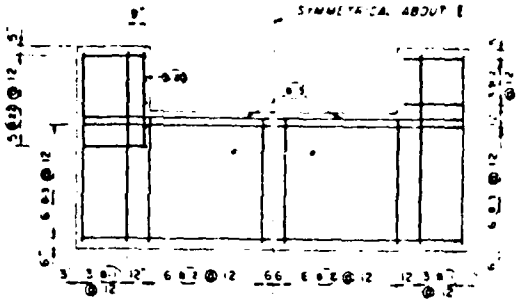
SECTION THRU BAFFLE



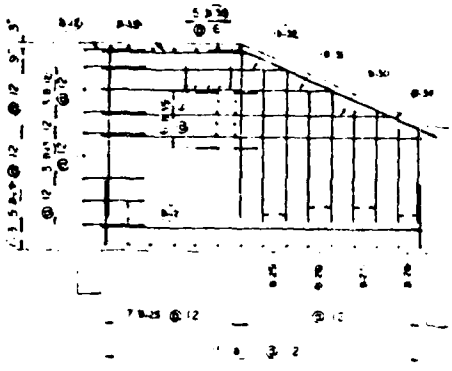
HRU BAFFLE INSIDE FACE



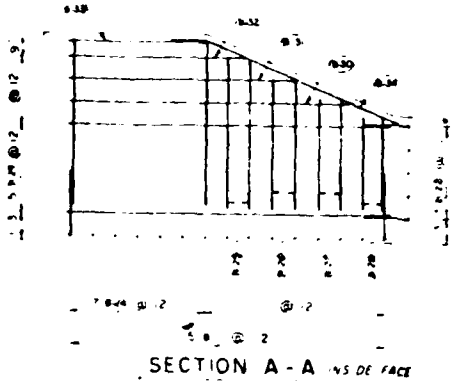
ON C-C INSIDE FACE



DOWNSTREAM FACE SECTION B - B UPSTREAM FACE

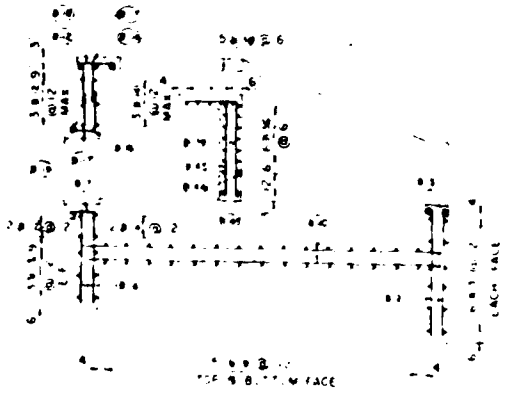


SECTION A - A OUTSIDE FACE



SECTION A - A INSIDE FACE

BAFFLE



SECTION ON ℄

STEEL SCHEDULE

MARK	LOCATION	BARS	SIZE	LENGTH	TYPE	A	B	TOTAL
B	CUTOFF	12	5	8-8	1			22
2		24	5	9-7	1			36
3		20	5	17-0	1			340
4		10	5	2-6	1			25
B 5		8	5	2-3	2	10-9	1-6	90
6		4	5	4-3	1			17
7		3	5	5-3	2	4-3	1-0	15
8		12	5	10-9	1			130
9	FLOOR	50	5	17-0	1			850
B-10		36	5	6-0	1			216
B-11		60	5	3-0	2	2-0	1-0	21
12	WING WALL	2	5	9-5	2	7-1	2-4	38
13		6	5	6-6	2	4-2	2-4	78
14		7	5	11-6	1			80
B 15		6	5	5-3	2	4-3	1-0	53
16		3	5	3-6	2	2-6	1-0	23
17		1	5	2-6	1			13
18		4	5	4-0	2	6-2	2-4	64
19		4	5	3-9	1			51
B 20	WING WALLS	2	5	4-3	1			8
21		6	5	2-9	1			69
22		10	5	9-3	2	2-6	2-9	92
23	SIDEWALLS	14	5	9-4	2	7-10	1-6	316
24		4	5	7-6	1			30
B 25		8	5	9-3	1			96
26		8	5	5-9	1			48
27		8	5	5-8	1			47
28		8	5	4-3	1			34
29		20	5	4-9	1			95
B 30		4	5	12-6	1			50
31		4	5	9-6	1			38
32		4	5	6-6	1			26
33		4	5	6-0	1			24
34		4	5	11-0	12	9-6	1-7	446
B 35	BAFFLE	34	5	3-9	2	2-9	1-0	270
36		17	5	10-6	1			186
37		2	5	6-4	21	4-0	2-4	267
38		4	5	5-4	21	3-0	2-4	215
39		5	5	6-7	2	4-3	2-4	329
B 40		8	5	2-6	1			20
41		2	5	4-0	1			8
42		4	5	5-0	1			20
43		5	5	4-3	1			21
44		2	5	5-6	1			11
B 45		2	5	3-6	1			7

1 21 22

BAR TYPES

SEE SHEET 10 FOR CONSTRUCTION DETAILS

IMPACT BASIN QUANTITIES

REINFORCING STEEL

NO 5 BARS 3933.60 LIN FT 4102.7 LBS

CONCRETE

30.96 CU YDS

10/10/69

FINCH HOLLOW, LITTLE CHOCONUT & TROUT BROOK WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 2-B
LITTLE CHOCONUT CREEK
IMPACT BASIN DETAILS

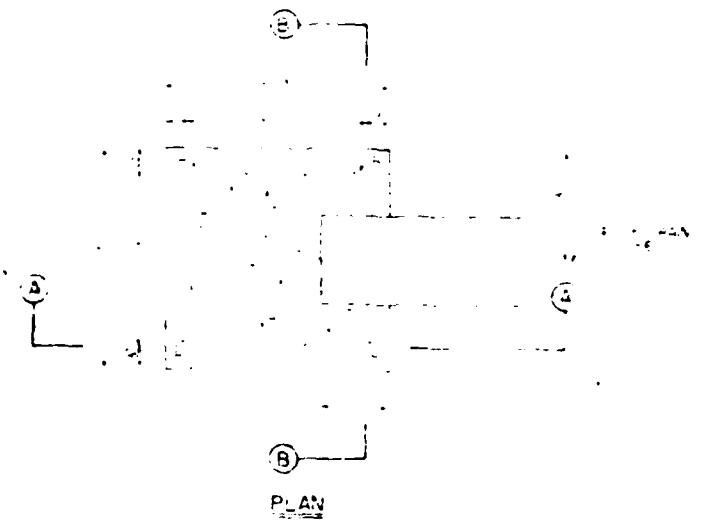
16
19 NY-2017-P

CONSTRUCTION DETAILS

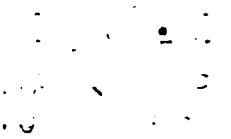
1. All welds shall be continuous 3/16 inch fillet welds unless otherwise noted on the drawings.
2. Materials shall be ASTM A36 steel unless otherwise noted.
3. Trash rack shall be painted with one coat of primer and two coats of black enamel.

ISOMETRIC

NOT TO SCALE

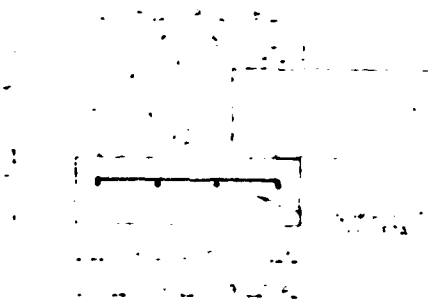


PLAN

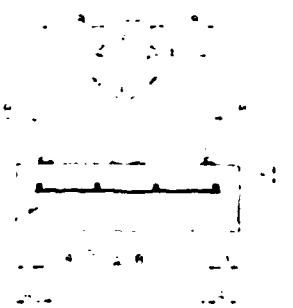


ANCHOR BOLT DETAIL

NOT TO SCALE



SECTION A-A

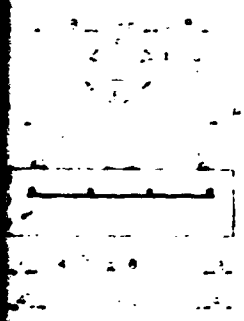


SECTION B-B

SCALE: 3/4 INCHES

ISOMETRIC

HOR BOLT DETAIL



SECTION B-B

AS BUILT

10/19/60

FINCH HOLLOW, LITTLE CHOCONUT &
TROUT BROOK WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 2-B
LITTLE CHOCONUT CREEK
OUTLET DRAIN INLET DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

17. NY-2017-P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